

**WebSphere®** software

# Discovering what is new in IBM Integration Bus Version 9.0



## Agenda

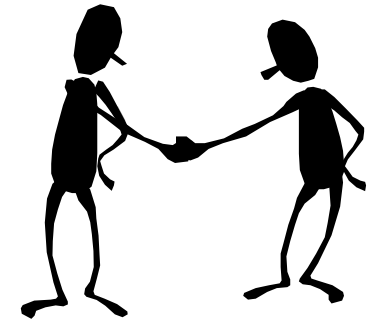
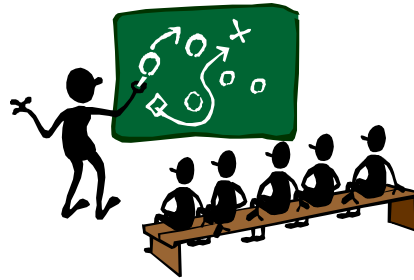
- Day 1
  - Welcome / intro / agenda
  - Introduction to IBM® Integration Bus
  - Applications and libraries
    - Data Format Description Language (DFDL)
    - Graphical Data Mapper
    - Business Decision Node
  - Integration Services
    - MQ Services
    - Database Services
- Day 2
  - WebSphere ESB conversion
    - Workload Management
  - Policies
  - Web Admin/Analytics
- Wrap-up

## Welcome to the IBM office

- Access restrictions
- Restrooms
- Emergency exits
- Smoking policy
- Breakfast/lunch



## Meet the IBM team ...



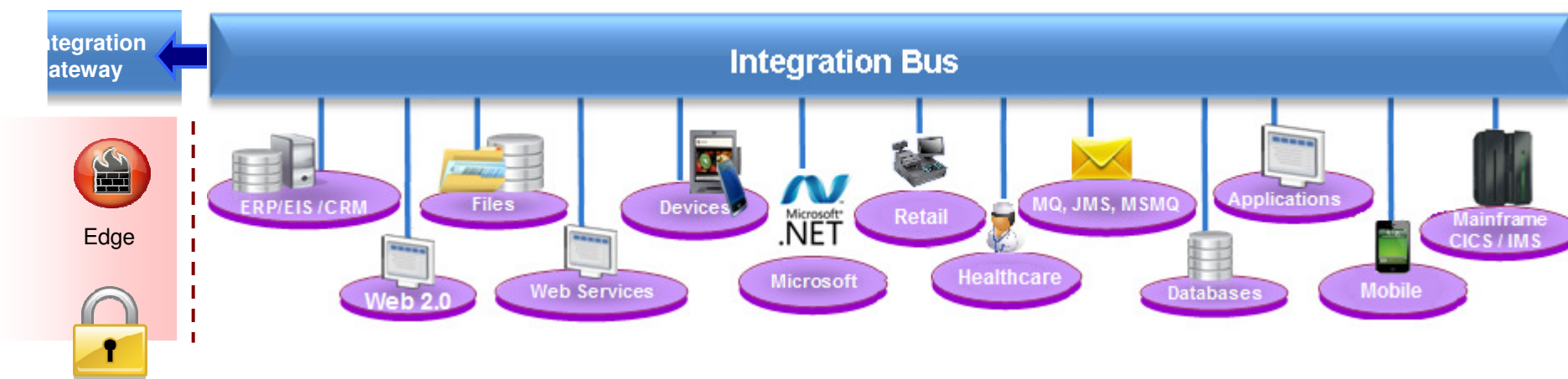
## Let's meet **you**!!!

- Your name?
- Your company/organization?
- Your job responsibilities?
- what are your interests and expectations?



## Introducing IBM Integration Bus

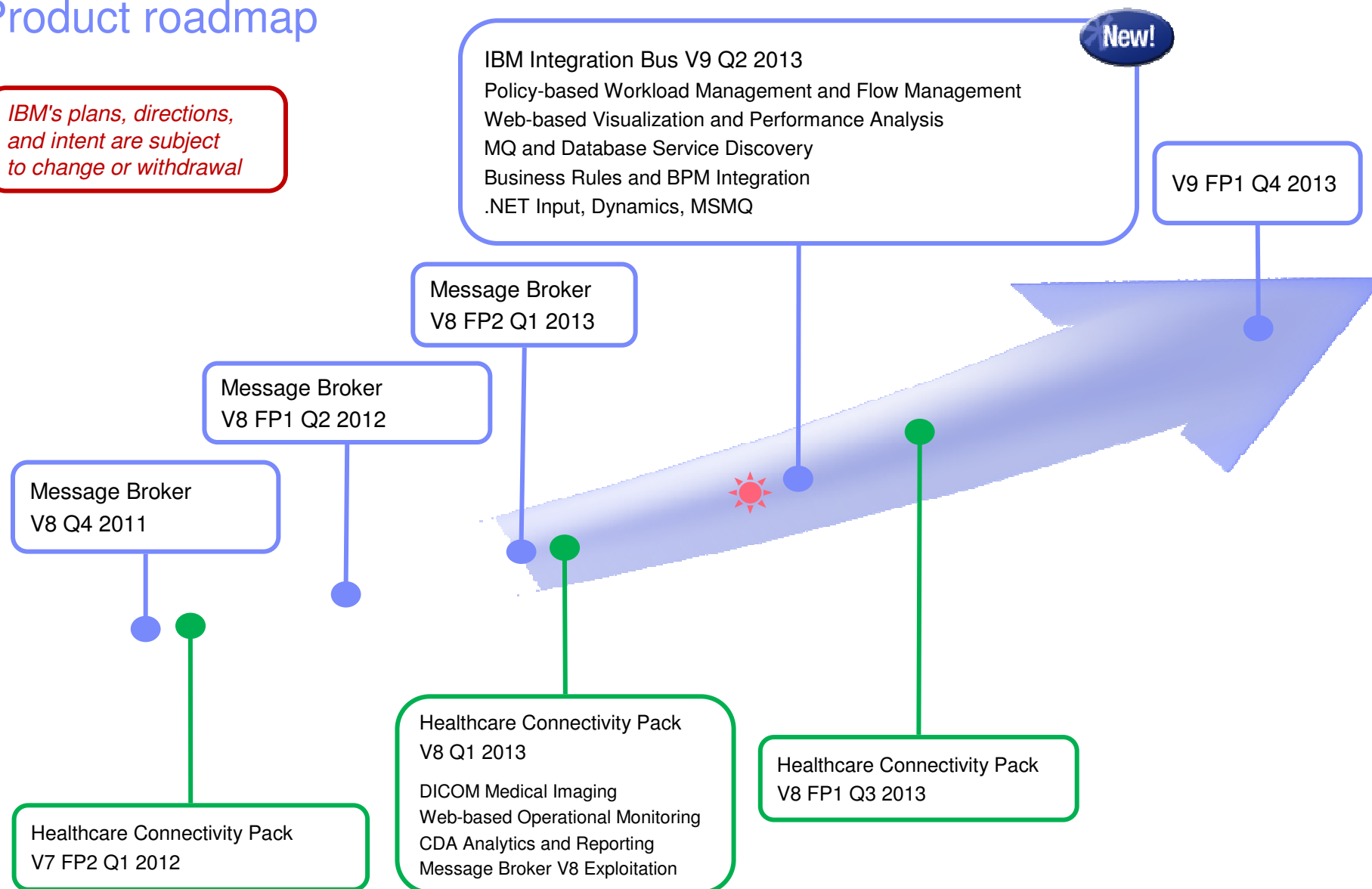
- IBM's strategic integration technology
  - Single engineered product for .NET, Java and fully heterogeneous integration scenarios
  - DataPower® continues to evolve as IBM's integration gateway



- A natural evolution for WebSphere Message Broker users
  - Significant innovation and evolution of WMB technology base
  - new features for Policy-based WLM, BPM integration, Business rules and .NET
- Designed to incorporate WebSphere Enterprise Service Bus use cases
  - Capabilities of WESB are folded in to IBM Integration Bus over time
  - Conversion tools for initial use cases built in to IIB from day one
  - WESB technology remains in market, supported. Migrate to Integration Bus when ready

## Product roadmap

*IBM's plans, directions,  
and intent are subject  
to change or withdrawal*



## IBM integration themes

### ▪ Simple and productive

- Making it easier and quicker to develop and manage integration solutions
  - Learn, Develop, Deploy, Manage, Migrate quickly and easily



### ▪ Universal and independent

- Connecting to a range of different systems
  - Universal connectivity includes standards, de facto standards, industry and custom systems

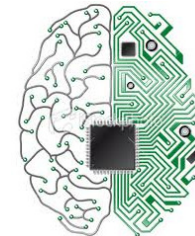
### ▪ Industry specific and relevant

- Provide industry relevant connectivity packs to solve domain specific problems
  - Industry specific nodes, solution-oriented patterns and user-oriented tooling



### ▪ Dynamic and intelligent

- Allow the creation of dynamic solutions that provide business insight
  - Flexible configuration tools, analysis of data and intelligence



### ▪ High performing and scalable

- Provide a platform and technology neutral connectivity option
  - Work on the widest possible range of hardware, software and virtualized environments





## Integration Bus content

- Simple and productive
  - Graphical Mapper: Stored procedures, patterns and enhanced conversion of older maps
  - BPM Express/Standard (Lombardi) integration: Process Designer synergy and integrated deployment
  - Web tools: Real-time performance statistics for understanding system behaviour
- Universal and independent
  - WESB conversion: Import and conversion of mediation flows and “to do” list
  - MQ service discovery to facilitate sharing of service definitions
  - Database discovery and analysis tools for diversified access to systems of record
  - DFDL improvements including lengthkind “pattern” and enhancements for TLOG
  - .NET Input node, Dynamics and MSMQ samples and patterns, support for Windows Server 2012
- Industry specific and relevant
  - Healthcare Pack update: MB8 Exploitation, DICOM Imaging, Analytics with Netezza® and Cognos®
- Dynamic and intelligent
  - Integrated workload traffic shaping policies to manage back-end system load
  - Managing unresponsive integration flows for improved overall system reliability
  - Business Decision Services using ODM technology for business rules integration
  - Security enhancements: Improved BasicAuth, Multiple certificates, CRL checking
- High Performing and scalable
  - Embedded cache extensions: External cache, expiry and SSL support
  - Flexible Cloud Provisioning with Pure, including Pure POWER® support

## A broad range of supported platforms and environments

### ▪ Broad range of operating system and hardware platforms supported

- AIX, Windows, z/OS, HP-UX, Linux on xSeries, pSeries, zSeries, Solaris (x86-64 and SPARC), Ubuntu
- Optimized 64-bit support on all platforms; 32-bit option available for Windows and x/Linux
- new support for Windows 8 and Windows Server 2012; .NET CLR V4.5 included on Windows
- Express, Standard and Advanced editions make IIB applicable for all solutions and budgets
  - All new V9 features available in all editions unless otherwise stated

### ▪ Virtual images for efficient utilization and simple provisioning

- Extensive support for virtualized environments such as VMWare, AIX Hypervisor... any!
- IBM Workload Deployer for x/Linux and AIX
- Support for Pure on POWER hardware to complement xLinux
- SmartCloud and IBM Workload Deployer images for simplified solution provisioning

### ▪ Includes access to full range of industry standard databases and ERP systems

- DB2®, Oracle, Sybase, SQL Server, Informix, solidDB®
- Open Driver Manager support enables new ODBC databases to be accessed
- JDBC Type 4 for popular databases
- SAP, Siebel, Peoplesoft, JDEdwards at no additional cost

### ▪ Technology components and prerequisites

- Java 7 on all platforms
- MQ 7.5 prerequisite (7.1 on z/OS®)

### ▪ Detailed System Requirements

- Posted on [www.ibm.com/integration-bus](http://www.ibm.com/integration-bus)



Traditional OS



Public Cloud



Private Cloud



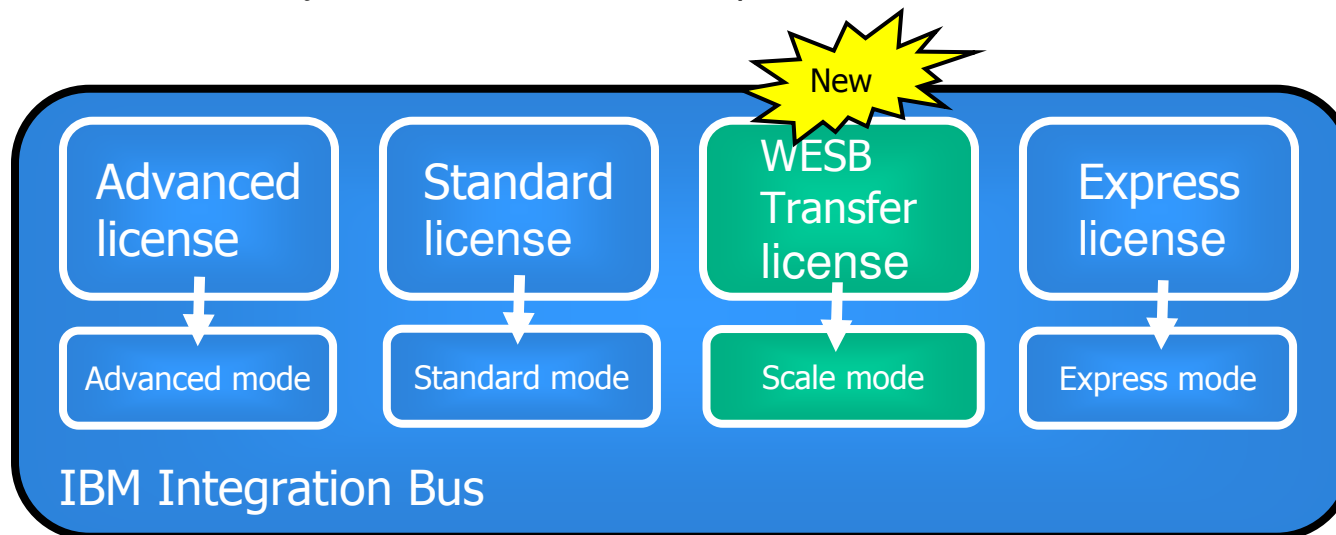
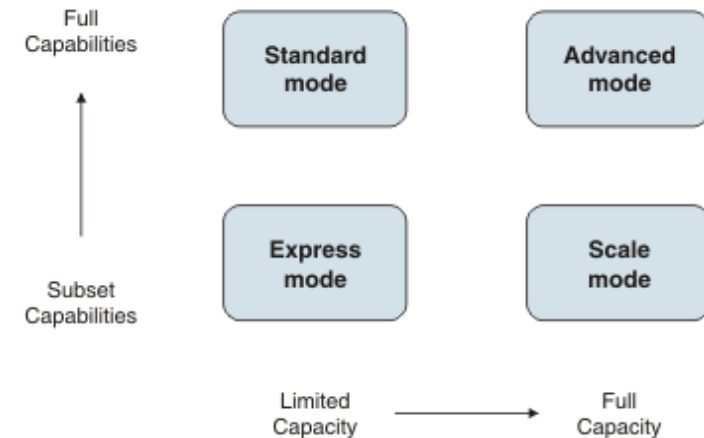
IBM Workload Deployer



IBM Pure

## Transfer licensing and modes of operation

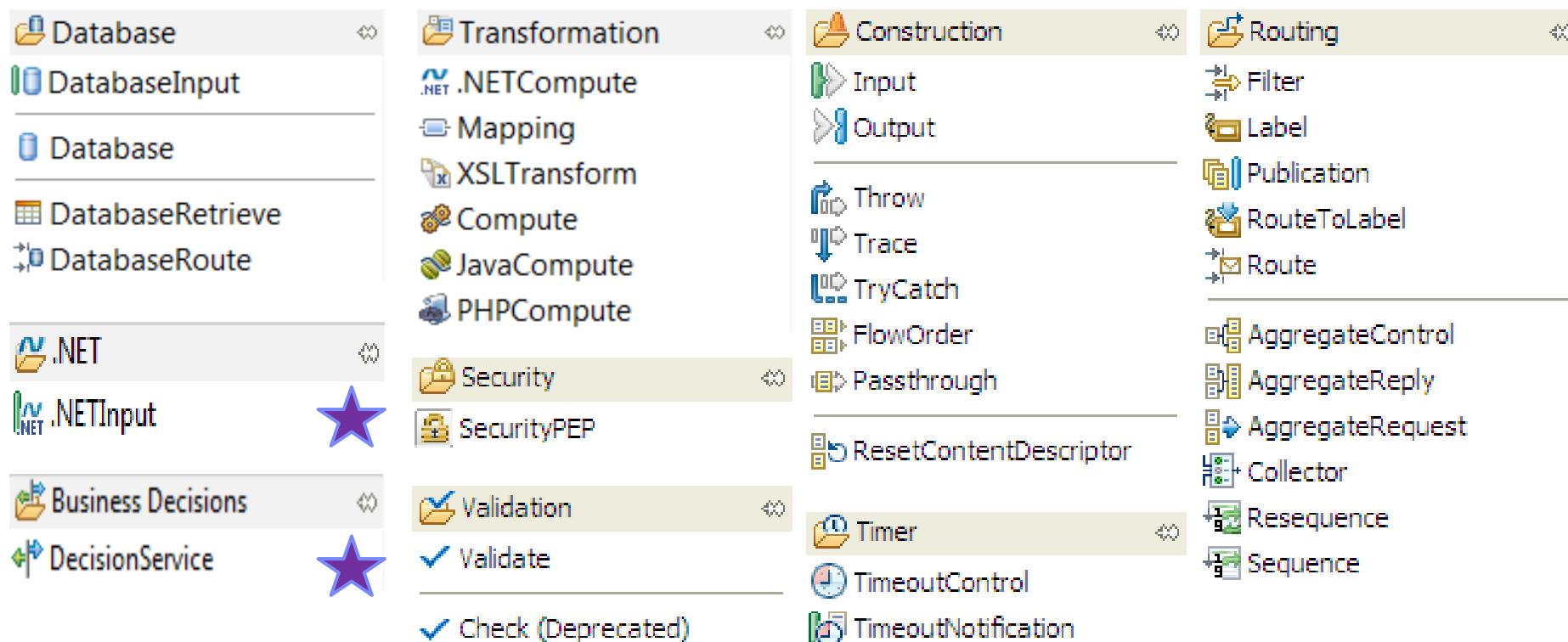
- **Express:** A limited set of nodes are enabled for use within a single execution group. Message flows are unlimited.
- **Scale:** A limited set of nodes are enabled for use within unlimited execution groups. Message flows are unlimited.
- **Standard:** All features are enabled for use with a single execution group. The number of message flows that you can deploy are unlimited.
- **Advanced:** All features are enabled and no restrictions or limits are imposed. This mode is the default mode, unless you have the Developer Edition.



## Nodes in V9 — Cover many transports

<b>WebSphere MQ</b> <ul style="list-style-type: none"> <li>MQInput</li> <li>MQOutput</li> <li>MQReply</li> <li>MQGet</li> <li>MQHeader</li> </ul> <hr/> <li>MQOptimizedFlow (Depre...)</li>	<b>Web Services</b> <ul style="list-style-type: none"> <li>SOAPInput</li> <li>SOAPReply</li> <li>SOAPRequest</li> <li>SOAPAsyncRequest</li> <li>SOAPAsyncResponse</li> </ul> <hr/> <li>SOAPEnvelope</li> <li>SOAPExtract</li> <hr/> <li>RegistryLookup</li> <li>EndpointLookup</li>	<b>CICS</b> <ul style="list-style-type: none"> <li>CICSRequest</li> </ul> <hr/> <li>IMS</li> <ul style="list-style-type: none"> <li>IMSRequest</li> </ul> <hr/> <li>CORBA</li> <ul style="list-style-type: none"> <li>CORBARequest</li> </ul> <hr/> <li>WebSphere Adapters</li> <ul style="list-style-type: none"> <li>PeopleSoftInput</li> <li>PeopleSoftRequest</li> </ul> <hr/> <li>SAPInput</li> <ul style="list-style-type: none"> <li>SAPRequest</li> <li>SAPReply</li> </ul> <hr/> <li>SiebelInput</li> <ul style="list-style-type: none"> <li>SiebelRequest</li> </ul> <hr/> <li>JDEdwardsInput</li> <ul style="list-style-type: none"> <li>JDEdwardsRequest</li> </ul> <hr/> <li>TwineBallInput</li> <ul style="list-style-type: none"> <li>TwineBallRequest</li> </ul>	<b>JMS</b> <ul style="list-style-type: none"> <li>JMSInput</li> <li>JMSOutput</li> <li>JMSReply</li> <li>JMSReceive</li> <li>JMSHeader</li> </ul> <hr/> <li>JMSMQTransform</li> <li>MQJMSTransform</li>
<b>HTTP</b> <ul style="list-style-type: none"> <li>HTTPInput</li> <li>HTTPReply</li> <li>HTTPRequest</li> <li>HTTPHeader</li> <li>HTTPAsyncRequest</li> <li>HTTPAsyncResponse</li> </ul>	<b>File</b> <ul style="list-style-type: none"> <li>FileInput</li> <li>FileOutput</li> <li>FileRead</li> </ul> <hr/> <li>FTEInput</li> <li>FTEOutput</li> <hr/> <li>CDInput</li> <li>CDOOutput</li>	<b>Email</b> <ul style="list-style-type: none"> <li>EmailInput</li> <li>EmailOutput</li> </ul>	<b>TCPIP</b> <ul style="list-style-type: none"> <li>TCPIPClientInput</li> <li>TCPIPClientOutput</li> <li>TCPIPClientReceive</li> </ul> <hr/> <li>TCPIPServerInput</li> <li>TCPIPServerOutput</li> <li>TCPIPServerReceive</li>
<b>SCA</b> <ul style="list-style-type: none"> <li>SCAInput</li> <li>SCAReply</li> <li>SCARequest</li> <li>SCAAsyncRequest</li> <li>SCAAsyncResponse</li> </ul>			

## Nodes in V9 — Provide many functions



- Additional nodes available as product extensions or SupportPacs
  - For example, WebSphere TX, VSAM, QSAM and others
- And, you can create your own Custom Nodes in C or Java >>>



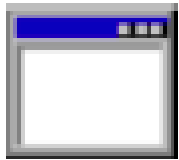
MyCustomNode

# Applications and libraries



## Applications and libraries organize your resources

- **Applications and Libraries encapsulate resources**



### Application

All resources required to solve a connectivity problem



### Library

A logical grouping of related routines or data

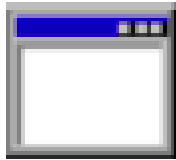
- **Toolkit and broker runtime**

- Make development and management easier

## Features of applications and libraries

### ▪ Deployable containers of IIB resources

- Message flows, subflows, message definitions (DFDL, XSDs), ESQL, JARs, XSL, Adapter files, etc.

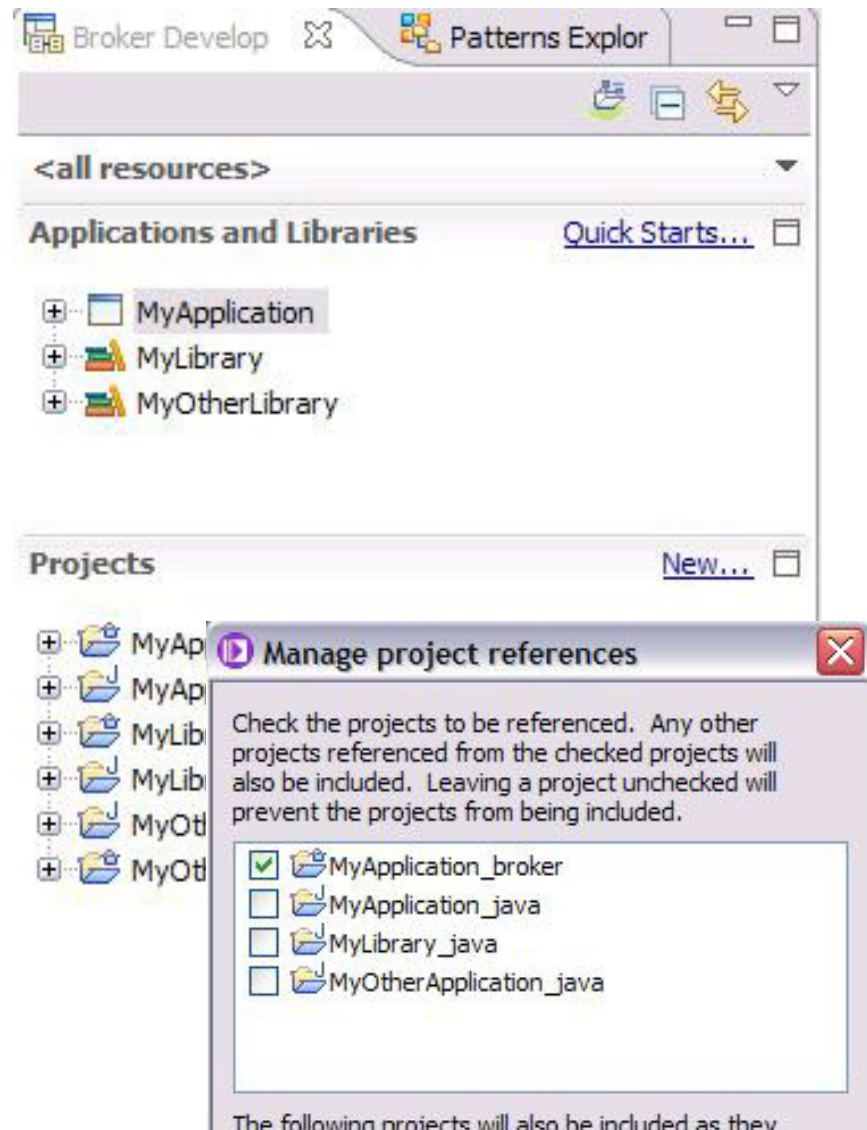


- ▶ Applications promote encapsulation and isolation
  - ▶ “Main” message flows and required components
  - ▶ Deploy multiple applications to an execution group
  - ▶ Visibility of resource restricted to containing application



- ▶ Libraries facilitate re-use
  - ▶ Resources shared across applications
  - ▶ Message definitions, common subflows, etc.
  - ▶ Multiple libraries to group related resources
    - ▶ for example, by type or function

## Applications and libraries organize your resources



- **Shown in Bus Development view**
- **List of referenced projects from workspace**
  - Projects are folders
  - Eclipse uses to contain / access files
  - “Integration Bus” project type
    - Contain anything IIB specific

## Broker Archive – Manage tab

**Manage**  
Rebuild, remove, edit, add resources

Filter by: <Type filter text>

Name	Type	Modified	Size	Path	Version	Comment
MyWMBApplication	Application	Jun 12, 2011 11:13:33 PM	19282			
MyWMBApplication.xsdzip	XSDZIP file	Jun 12, 2011 11:13:32 PM	6809			
BuildShipPartRequest.map	MAP file	Jun 12, 2011 11:13:32 PM	4879			
BuildShippedPOResponse.map	MAP file	Jun 12, 2011 11:13:32 PM	4591			
OrderRejectedResponse.map	MAP file	Jun 12, 2011 11:13:32 PM	4556			
MySubflowLibrary	Library	Jun 12, 2011 11:13:32 PM	900			
MyESQLLibrary	Library	Jun 12, 2011 11:13:32 PM	601			
ProcessShipping.cmf	Compiled message flow	Jun 12, 2011 11:13:32 PM	5944			
MyWMBApplicationFlow.	Compiled message flow	Jun 12, 2011 11:13:32 PM	36468			

Prepare Manage

Application deployment contains:

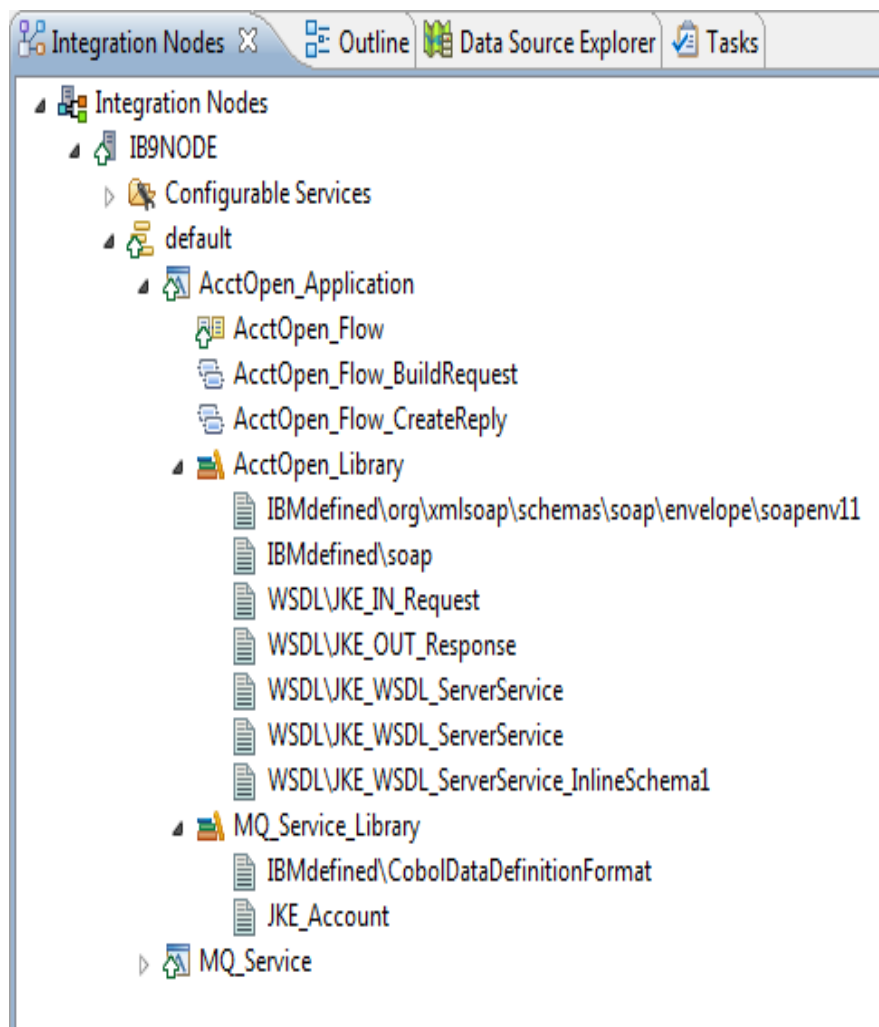
- ▶ Zip file of all XSD and WSDL from IB projects referenced from the Application project
- ▶ Deployable flows
- ▶ Libraries referenced from application (directly or indirectly)
- ▶ MessageSet – dictionary and xsdzip of schema files for each message set project referenced from Application

Complete Contents of the application that will be deployed in the application container

Library deployment contains:

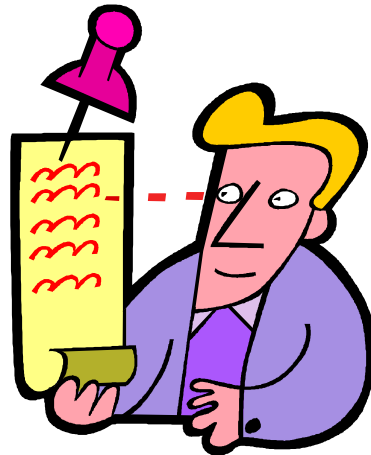
- ▶ Zip file of all XSD and WSDL from IB projects referenced from the Library project
- ▶ Deployable flows
- ▶ MessageSet – dictionary and xsdzip of schema files for each message set project referenced from library

## Applications and libraries on the Integration Server



- Deployed applications and libraries are displayed directly underneath the execution group in the Toolkit and IBX
  - Also available through CMP and mqsilist
- GUI, command line and CMP tools updated to expose operations that are applicable to libraries and applications
  - Starting and stopping applications
    - Starting an application implicitly starts all required message flows
  - Delete

# Data Format Description Language (DFDL)

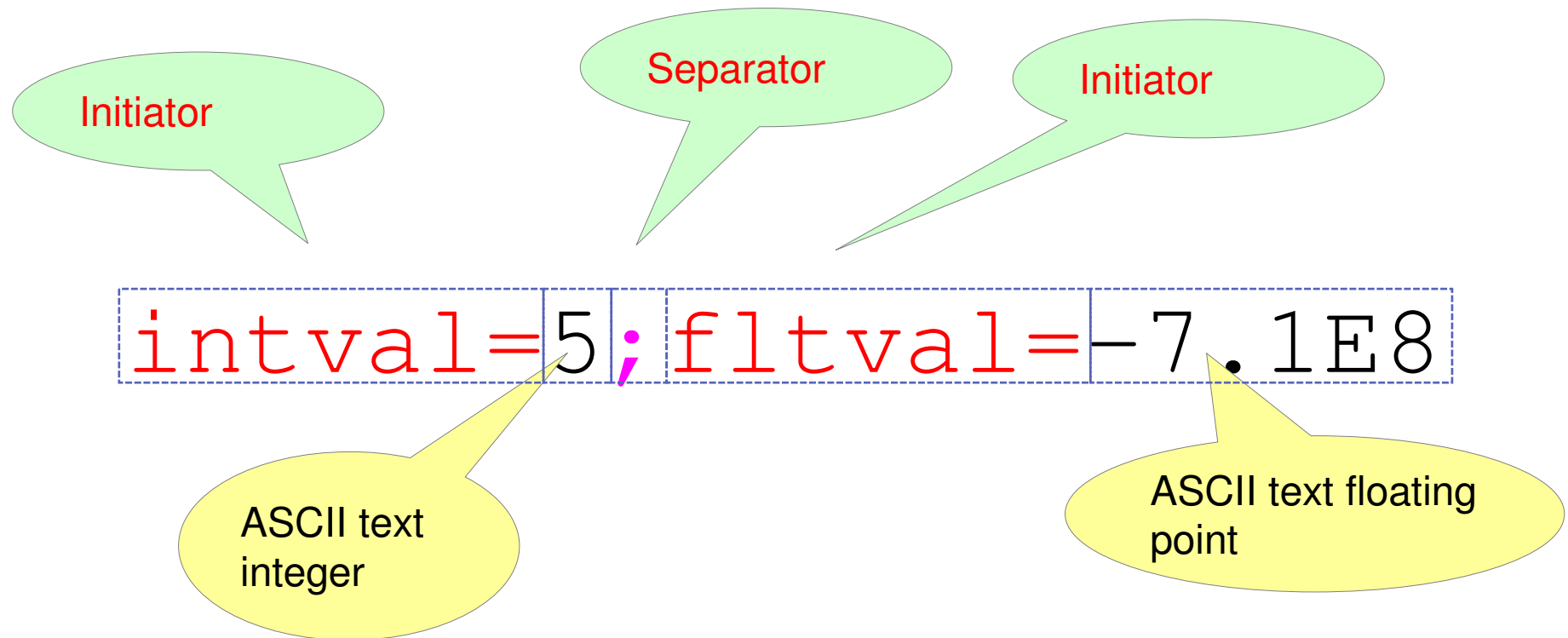


## Data Format Description Language (DFDL)



- A new **open** standard
  - From the Open Grid Forum (OGF)
    - <http://www.ogf.org/>
  - Version 1.0
  - “Proposed Recommendation” status
- A way of **describing** data...
  - It is NOT a data format itself!
- A **powerful** modeling language ...
  - Text, binary and bit
  - Commercial record-oriented
  - Scientific and numeric
  - Modern and legacy
  - Industry standards
- While allowing **high performance** ...
  - You choose the right data format for the job
- Leverage **XML Schema** technology
  - Uses W3C XML Schema 1.0 subset and type system to describe the **logical** structure of the data
  - Uses XSDL annotations to describe the **physical** representation of the data
  - The result is a **DFDL schema**
- Both **read and write**
  - Parse and serialize data in described format from same DFDL schema
- Keep simple cases **simple**
- Annotations are **human readable**
- **Intelligent** parsing
  - Automatically resolve choice and optionality
- **Validation** of data when parsing and serializing

## Example – Delimited text data



Separators, initiators (tags) and terminators are examples in DFDL of *delimiters*

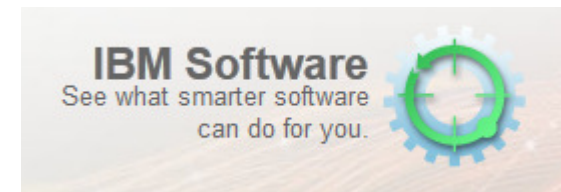
## DFDL features

- Language structures such as COBOL, C and PL/1
- Industry standards such as SWIFT, HL7, FIX, HIPAA, X12, EDIFACT, ISO8583
- Fixed data and data delimited by text or binary mark-up
- Text data types such as strings, numbers, zoned decimals, calendars, Booleans
- Binary data types such as integers, floats, BCD, packed decimal, calendars, Booleans
- Bi-directional text
- Bit data of arbitrary length
- Pattern languages for text numbers and calendars
- Ordered, unordered and floating content
- Default values on parsing and serializing
- Nil values for handling out-of-band data
- XPath 2.0 expression language including variables to model dynamic data
- Speculative parsing to resolve choices and optional content
- Fixed and variable arrays
- Hide elements in the data
- Calculate element values
- Validation to XML Schema 1.0 rules
- Scoping mechanism to allow common property values to be applied at multiple points

## DFDL adoption

- **IBM DFDL reusable component ships with:**

- IBM WebSphere Message Broker 8.0
- IBM Integration Bus 9.0
- IBM Rational® Performance Test Server 8.0.1
- IBM Rational Test Virtualization Server 8.0.1
- IBM Rational Test Workbench 8.0.1
- IBM Rational Developer for System z 8.5
- IBM InfoSphere® Master Data Management 11



- **Further IBM products and appliances investigating adoption**

- **Open-source DFDL implementation in progress (“Daffodil”)**

- Available as an alpha release (parser only)
- Partly funded by a major US government agency who are adopting DFDL as their standard way to parse text and binary data

- **DFDL web community on GitHub for collaborative authoring of DFDL schemas for commercial and scientific data formats**

DFDL Schemas web community **GitHub**

Search or type a command

Explore Features E

- Free public repository for DFDL models
- Hosted on the popular GitHub community website
- Unlimited read-only access
- Collaboration encouraged
- Evolving content



## DFDL Schemas for Commercial and Scientific Data Formats

<http://dfdlschemas.github.com>

smh@uk.ibm.com

Find a repository...

## NACHA

DFDL Schemas for NACHA

Updated 23 days ago

★ 0

## IBM4690-TLOG

DFDL schemas for Transaction Log data emitted by IBM/Toshiba 4690 point-of-sale devices.

Updated 3 months ago

★ 6

## dfdlschemas.github.com

Web pages for DFDLSchemas organization

Updated 3 months ago

CSS ★ 7

## HL7-v2.7

DFDL schemas for HL7 v2.7

Updated 7 months ago

★ 6

## ISO8583

DFDL schemas for ISO8583

Updated 7 months ago

★ 8

## ISO8583

DFDL schemas for ISO8583



tar.gz

.zip

This GitHub repository hold DFDL schemas that model ISO8583 credit/debit card data. There are DFDL schemas for the two most popular release of the standard:

- ISO8583:1987
- ISO8583:1993 (coming soon)

This is a public repository that allows anybody to view the content. If you would like to contribute to this repository, email the address on the organisation home page.

## IBM DFDL in IBM Integration Bus

- **IIB v9 uses IBM DFDL v1.1 component**
- **DFDL domain and parser**
  - Available in nodes, ESQL, Java
  - Use instead of MRM CWF/TDS
  - More capable and higher performing
  - Adopts XMLNSC tree shape
- **DFDL models**
  - Schema files reside in IIB libraries
  - Not in Message Sets
- **Tooling for creating DFDL models in IIBTK**
  - Guided authoring wizards
  - Language importer wizards
  - DFDL editor
- **DFDL model debugger**
  - Debug parsing and writing of data in IIBTK
  - No deploy to runtime necessary!
- **DFDL schema deployed in BAR file**
  - No dictionary file
- **Migration from v8**

The screenshot displays the 'New Message Model' dialog box for configuring a schema for CSV data. The 'Record settings' section shows 'End of record character' set to 'Carriage Return & Line Feed - %CR;%LF;' and 'Blank records' set to 'Skip a blank record'. The 'Field settings' section is partially visible. Below the dialog, the 'DFDL Test - Parse' window shows the status 'Parsing completed: Thu Jun 14 12:06:05 BST 2012'. The 'Input' section shows the data file '/ST\_DFDL\_CSV/TestData.txt'. The 'Parsed Input' section shows the resulting XML/JSON structure with fields like Year, Make, Model, Description, and Price.

	A	B	C	D	E
1	Year	Make	Model	Description	Price
2	2009	SK Inc	MBTk7	4293cc, V8	53880.00
3	2010	Hans On	DFDL	3000cc straight 6	31395.00
4	2010	AOD corp	MB8	4163cc, V8	51435.00

Export

Year,Make,Model,Description,Price  
 2009,SK Inc,MBTk7,"4293cc, V8",53880.00  
 2010,Hans On,DFDL,3000cc straight 6,31395.00  
 2010,AOD corp,MB8,"4163cc, V8",51435.00

New Message Model

Configure schema for CSV data

Provide settings for a new schema that will model CSV data.

Record settings

End of record character: Carriage Return & Line Feed - %CR;%LF;

Blank records: Skip a blank record Select the record terminator.

☒ The first record is a header

Field settings

DFDL Test - Parse: Runs the DFDL parser with the provided physical input data and

Status: Parsing completed: Thu Jun 14 12:06:05 BST 2012

Input

Data: /ST\_DFDL\_CSV/TestData.txt

Parsed Input

Characters

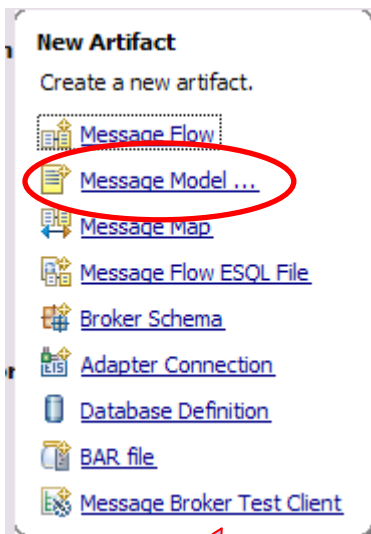
```
1 Year,Make,Model,Description,Price=
2 2009,SK Inc,MBTk7,"4293cc, V8",53880.00=
3 2010,Hans On,DFDL,3000cc, straight 6",313
4 2010,AOD corp,MB8,"4163cc, V8",51435.00
```

MQ Input Node Properties - SAMPLE\_ACE\_RSSDIF\_IN

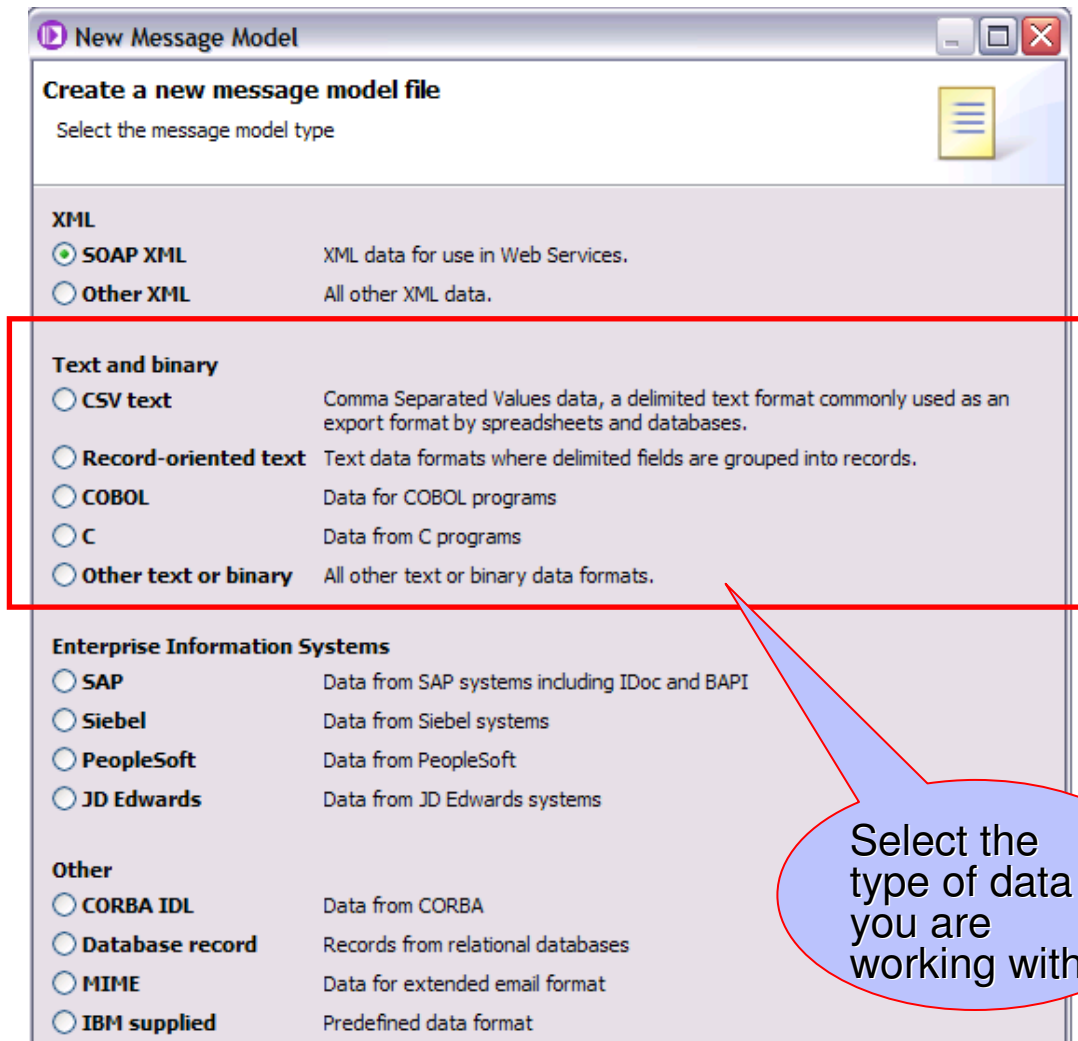
Description	Basic	Input Message Parsing	Parser Options	Advanced	Validation
Message domain	DFDL : For binary or text messages with a Data Format Description L				
Message model	<DFDL schema files in Applications and Libraries>				
Message	Transaction				

To open the DFDL schema file for the selected message, click here...

## Creating a DFDL model



new launcher  
for creating  
Integration Bus  
project artifacts



Select the  
type of data  
you are  
working with

- Or you can drop an existing DFDL schema into a Integration Bus library

## Wizard options for creating a DFDL model

- Guided authoring
- Using the DFDL editor
- Importing from other metadata
- Already have DFDL schema

Select how you want to create the DFDL model

**New Message Model**

**CSV text**

Choose how you would like to create your CSV message model.

WebSphere Message Broker requires a message model in order to parse, serialize and validate CSV data. A message model also speeds up development of your message broker applications by enabling ESQL content assist and graphical maps.

Comma Separated Values data is modeled by Data Format Description Language (DFDL) schema files. DFDL is a standard from the Open Grid Forum for describing all kinds of text and binary data.

☒ Create a DFDL schema file using this wizard to guide you.

☐ Create an empty DFDL schema file, I will model my data using the DFDL schema editor

☐ Import or replace the IBM supplied DFDL schema property defaults for CSV.

	A	B	C	D	E
1	Year	Make	Model	Description	Price
2	2009	SK Inc	MBTk7	4293cc, V8	53880.00
3	2010	Hans On	DFDL	3000cc straight 6	31395.00
4	2010	AOD corp	MB8	4163cc, V8	51435.00

**Export**

*Year,Make,Model,Description,Price  
2008,SK Inc,MBTk7,"4293cc, V8",53880.00  
2010,Hans On,DFDL,3000cc straight 6,31395.00  
2010,AOD corp,MB8,"4163cc, V8",51435.00*

**Navigation:** ? < Back Next > Finish Cancel

## Creating a DFDL model using guided authoring

The screenshot shows the 'New Message Model' dialog box for configuring a schema for CSV data. The 'Record settings' section includes options for 'End of record character' (Carriage Return & Line Feed - %CR;%LF;), 'Blank records' (Skip a blank record), and a checked option 'The first record is a header'. The 'Field settings' section shows 'Number of fields' set to 5. The 'Encoding code page options' section has 'Dynamic' selected. The 'Global settings' section shows 'Escape scheme' set to 'CSV Escape Scheme'. A red callout bubble points to the 'Record settings' section with the text 'Make selection'.

The 'Message Roots' table displays the generated model structure:

Name	Type	Min Occurs	Max Occurs	Default Value	Sample Test Data
[-] e company_message					
[-] ... sequence		1	1		
[-] e header		1	1		
[-] e record		1	unbounded		
[-] ... sequence		1	1		
[-] e field1	string	1	1	value1	value1
[-] e field2	string	1	1	value2	value2

A red callout bubble points to the 'e header' row in the table with the text 'Generated model'.

# Testing a DFDL model within the editor

**Run parser**

**Parsed 'infoSet'**

**Parsed data**

**Delimiters highlighted**

**Hex view**

**DFDL Test - Logical Instance**

Data source: <From 'DFDL Test - Parse' view>  
 Message root: Company (/MessageModelingLibrary/Company.xsd)

Name	Type	Value
Company		
CompanyName	xs:string	My Company
Employee		
EmpNo	xs:integer	111111
Dept	xs:integer	500
EmpName	xs:string	Alice Wong
Address		
Tel	xs:string	905-347-5649
Salary	xs:decimal	135599.95
Employee		
EmpNo	xs:integer	222222
Dept	xs:integer	500
EmpName	xs:string	James May
Address		
Tel	xs:string	208-203-1332
Salary	xs:decimal	189599.95

**DFDL Test - Parse**

Status: Parsing completed: Tue Jun 14 13:49:37 BST 2011

Input Data: C:\Data\argotools\VBeta\Company.txt

Parsed Input Characters

```

1 Company [compName=My Company]
2 Employee (empNum=111111 dept=500 empName=Alice Wong)
3 Employee (empNum=222222 dept=500 empName=James May Addr: 23 The
4 Employee (empNum=333333 dept=310 empName=Richard Hammond Addr:
5 Employee (empNum=444444 dept=230 empName=Jeremy Clarkson Addr:
6 Employee (empNum=555555 dept=650 empName=Humphrey Littleton Addr:
7
8
  
```

**Hex view**

```

3 45 6d 70 6c 6f 79 65 65 28 65 6d 70 4e 75 6d 3d 32 32 32 32 3
4 45 6d 70 6c 6f 79 65 65 28 65 6d 70 4e 75 6d 3d 33 33 33 33 3
5 45 6d 70 6c 6f 79 65 65 28 65 6d 70 4e 75 6d 3d 34 34 34 34 3
6 45 6d 70 6c 6f 79 65 65 28 65 6d 70 4e 75 6d 3d 35 35 35 35 3
7 5d 0d 0a
8
  
```

**Parsing completed successfully.**








Tips:

- Selecting an element in the DFDL editor will cause the parsed input to focus only on data pertaining to the selected element.
- The view menu on the view toolbar provides options to control how the data is displayed in the view. Click the arrow icon on the toolbar or [here](#) to open the menu.
- The logical instance that was created by the DFDL parser can be viewed by clicking on the Open DFDL Logical Instance View toolbar button or by clicking [here](#).
- The trace captured while running the DFDL parser can be viewed by clicking on the Open DFDL Trace View toolbar button or by clicking [here](#).

☐ Do not display this message again

## DFDL Schemas for industry formats

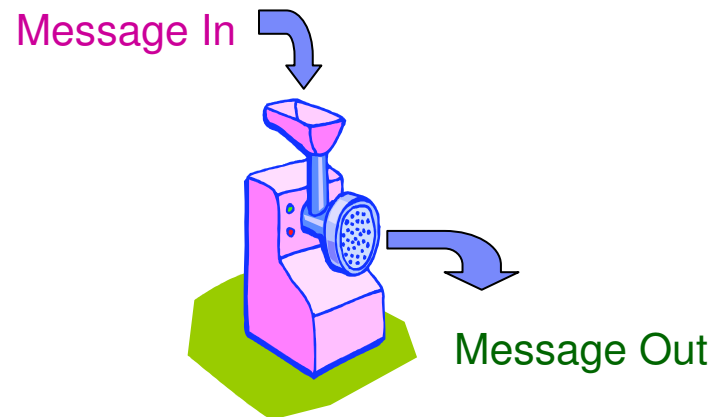
- **HL7 v2.5.1, v2.6 and v2.7**
  - Connectivity Pack for Healthcare
- **IBM/Toshiba 4690 SurePos ACE v7r3 TLOG**
  - DFDLSchemas on GitHub
- **NACHA**
  - DFDLSchemas on GitHub
- **ISO 8583 (1987)**
  - DFDLSchemas on GitHub
  - IBM Integration Bus sample
- **More to follow ...**

**▼ Messages**       

A message is a global element that models an entire document of data.

Name	Type	Min Occurs	Max Occurs
[-] [e] ISO8583			
[-] ... sequence		1	1
⋮ [e] MTI_Version	integer	1	1
⋮ [e] MTI_MessageClass	integer	1	1
⋮ [e] MTI_MessageFunction	integer	1	1
⋮ [e] MTI_MessageOrigin	integer	1	1
⋮ [-] [e] Bitmaps_Group		1	1
⋮ [-] ... sequence		1	1
⋮ [+ [e] PrimaryBitmap	PrimaryBitmapType	1	1
⋮ [+ [e] SecondaryBitmap	SecondaryBitmapType	0	1
⋮ [e] PrimaryAccountNumber_002	<Type_n_LL>	0	1
⋮ [e] ProcessingCode_003	<Type_n_string>	0	1
⋮ [e] AmountTransaction_004	<Type_n_decimal>	0	1

# Graphical Data Mapper



## About mapping

- **Improved usability**

- Simple learning curve
- Simple transformations are simple to create
- Complex transformations build on concepts previously mastered

- **Improved capability**

- Builds upon “best of breed” mapping technologies in IBM products
- Full XPath 2.0 expression support
  - Standards-based language designed for hierarchical data structures

- **Improved performance**

- Dedicated runtime engine

## Mapping Node



Mapping

- **Simplest way to transform a message**
- **Graphical transformation editor**
  - Shows source/target messages and database tables
  - Drag-and-drop fields/columns
  - XPATH, Java or Extended Structured Query Language (ESQL) can be used
- **Full XPath 2.0 scripting support**
- **Properties folder and transport headers supported**
- **LocalEnvironment supported**
- **Submaps for reuse**
  - Can be called from another Map

## Mapping Node (continued)

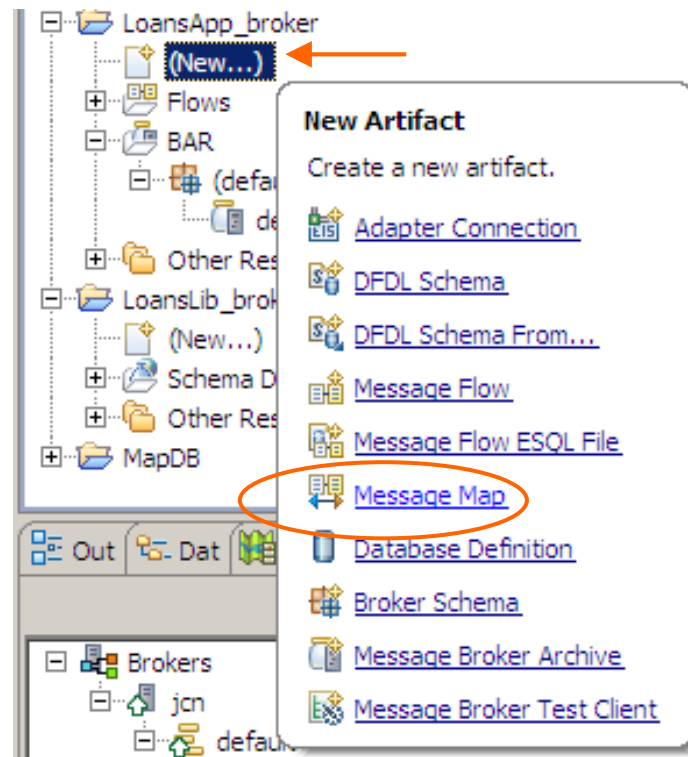


Mapping

- **Handles repeating elements nicely**
- **Split/fork an incoming message**
- **Database tables as a Source and/or Target**
  - Inserts, deletes, updates, stored procedures
- **Map By Name provides automatic mapping**
  - Identical Definitions – Either “tree copy” or individual fields
  - Similar Definitions – Selection based on field names and percentage matched

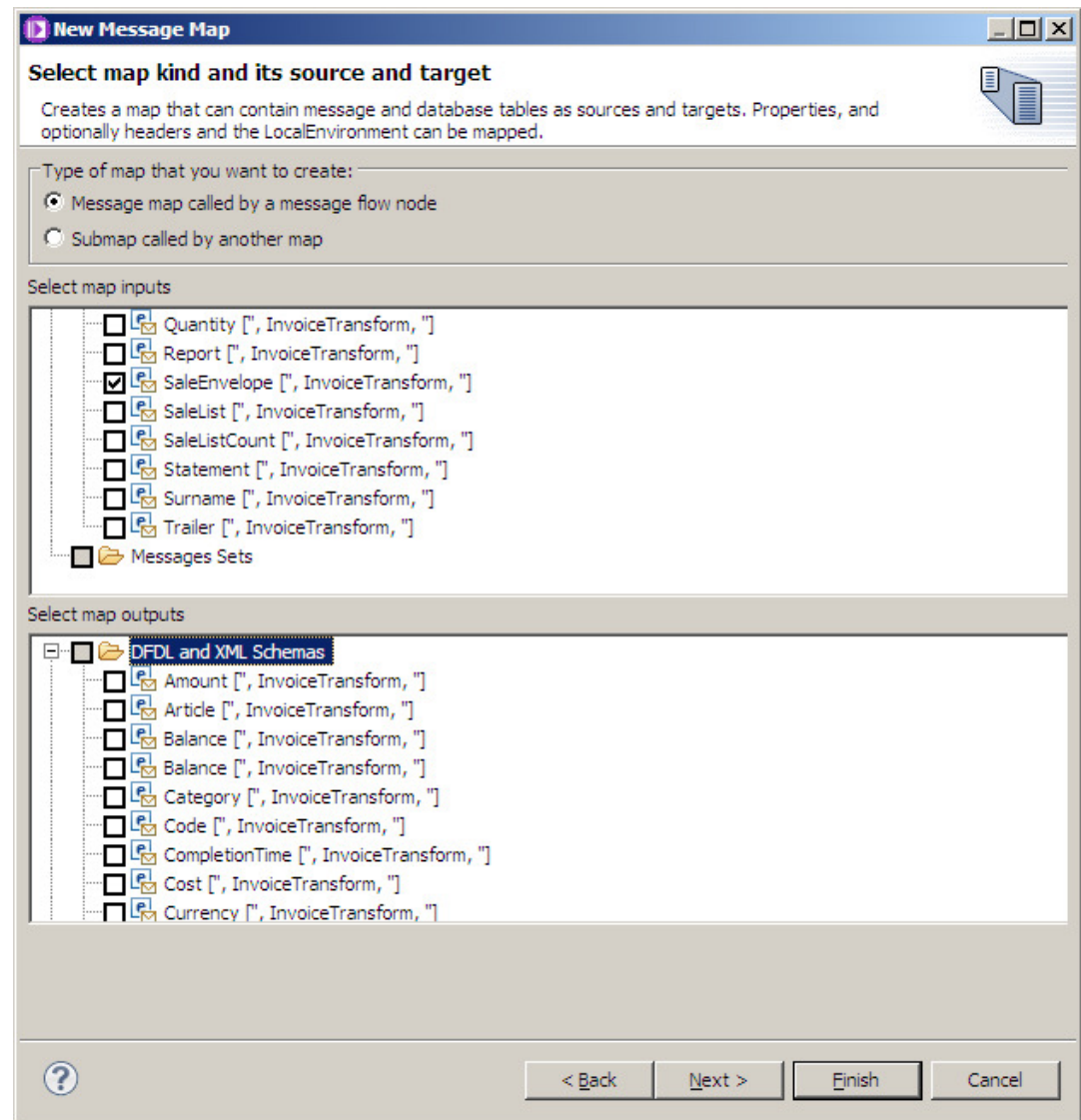
## Creating a new map

- new maps are created by double clicking on a mapping node, or from the project view
- Dialog box launched to select source and target definitions
  - DFDL, XSD, Message Set
- new map is opened in mapping editor

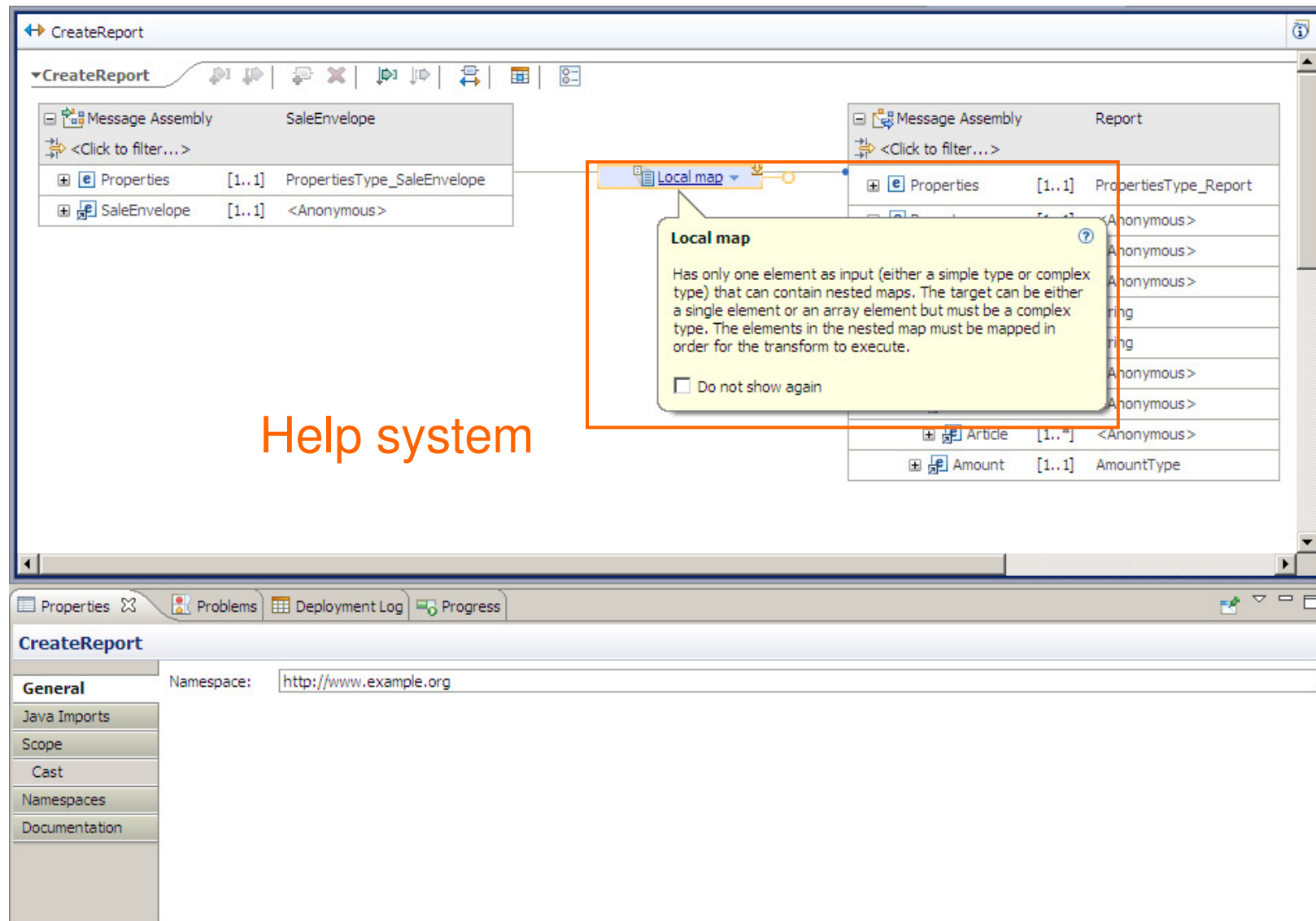


## Specify source and target types

- **Select root elements**
- **Supports:**
  - Message Sets
  - XSD schemas
  - DFDL schemas


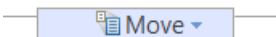
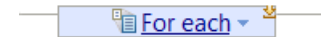
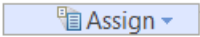
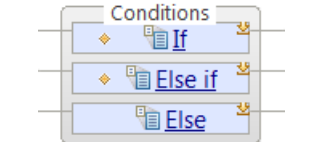
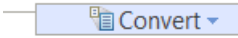

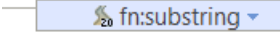

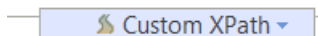

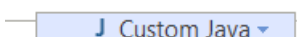
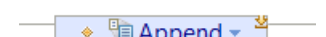
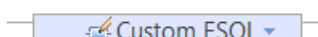
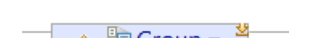


# The Mapping Editor



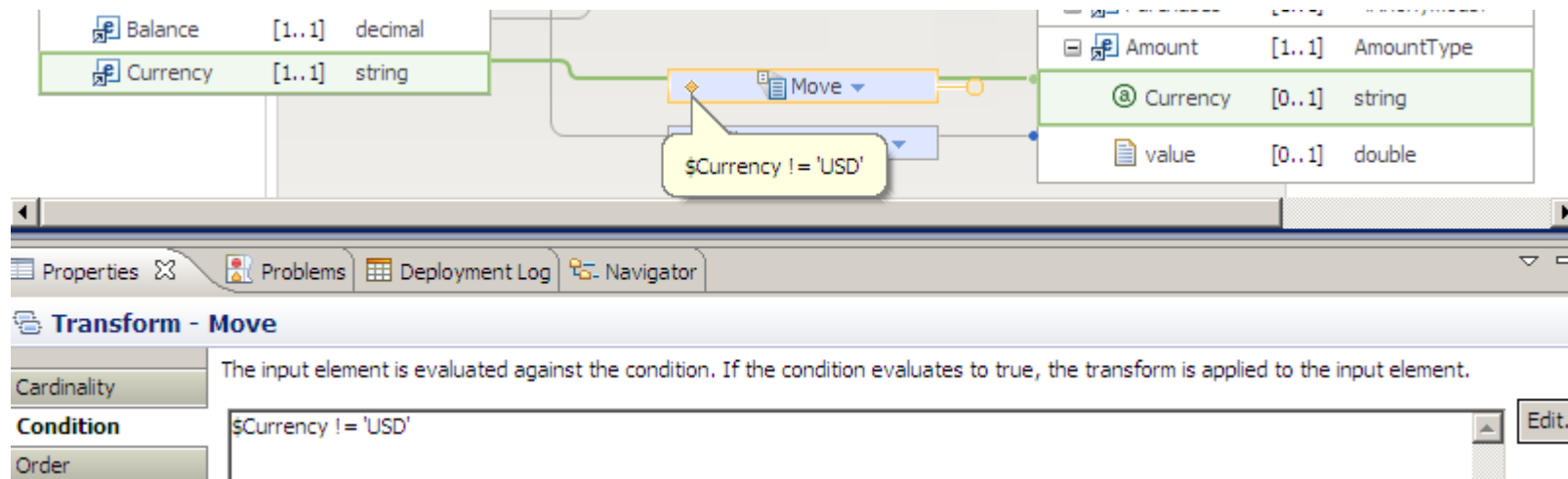
Help system

## Transform types

- |                    |   |   |                                       |
|--------------------|---|---|---------------------------------------|
| ▪ <b>Local</b>     |    |   | ▪ <b>Move</b>                         |
| ▪ <b>For each</b>  |    |   | ▪ <b>Assign</b>                       |
| ▪ <b>If / Else</b> |    |   | ▪ <b>Convert</b>                      |
| ▪ <b>Submap</b>    |    |   | ▪ <b>XPath function – categorised</b> |
| ▪ <b>Create</b>    |    |   | ▪ <b>Custom XPath expression</b>      |
| ▪ <b>Join</b>      |    |   | ▪ <b>Java – user defined</b>          |
| ▪ <b>Append</b>    |   |  | ▪ <b>ESQL – user defined</b>          |
| ▪ <b>Group</b>     |  |   |                                       |

## Conditional mapping

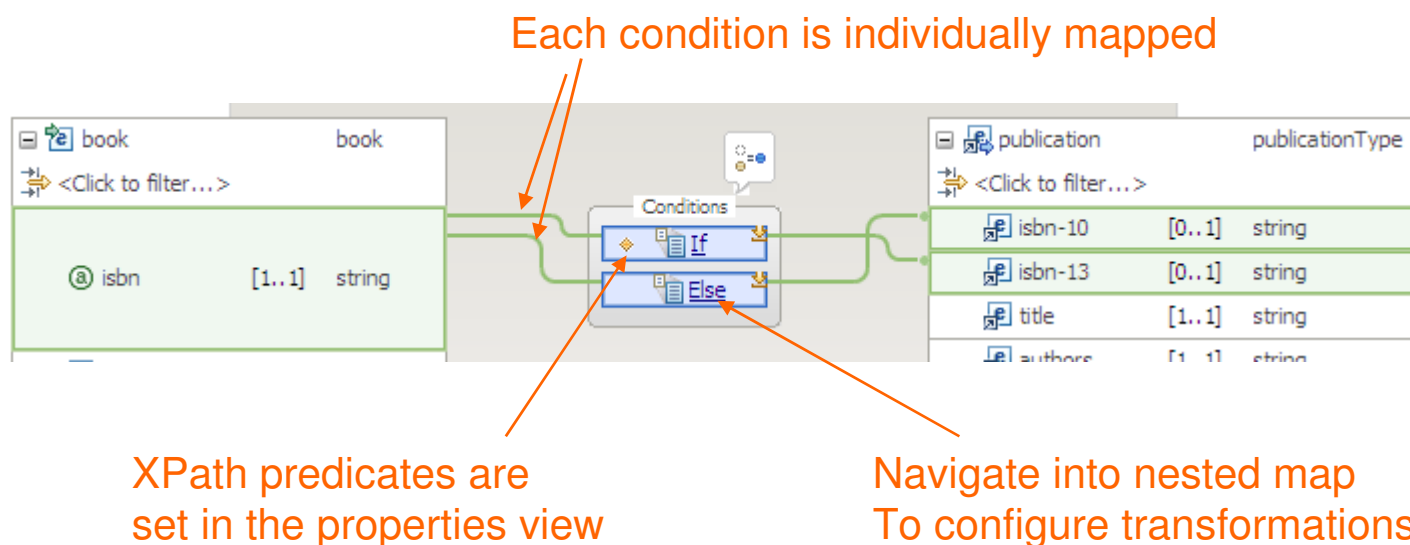
- **Individual transforms can be configured to occur only if a condition is met**
  - “Condition” tab on properties page
    - User enters an XPath 2.0 predicate
    - Content assist available
    - XPath 2.0 builder available
    - Mapping is only performed if predicate evaluates to “true”



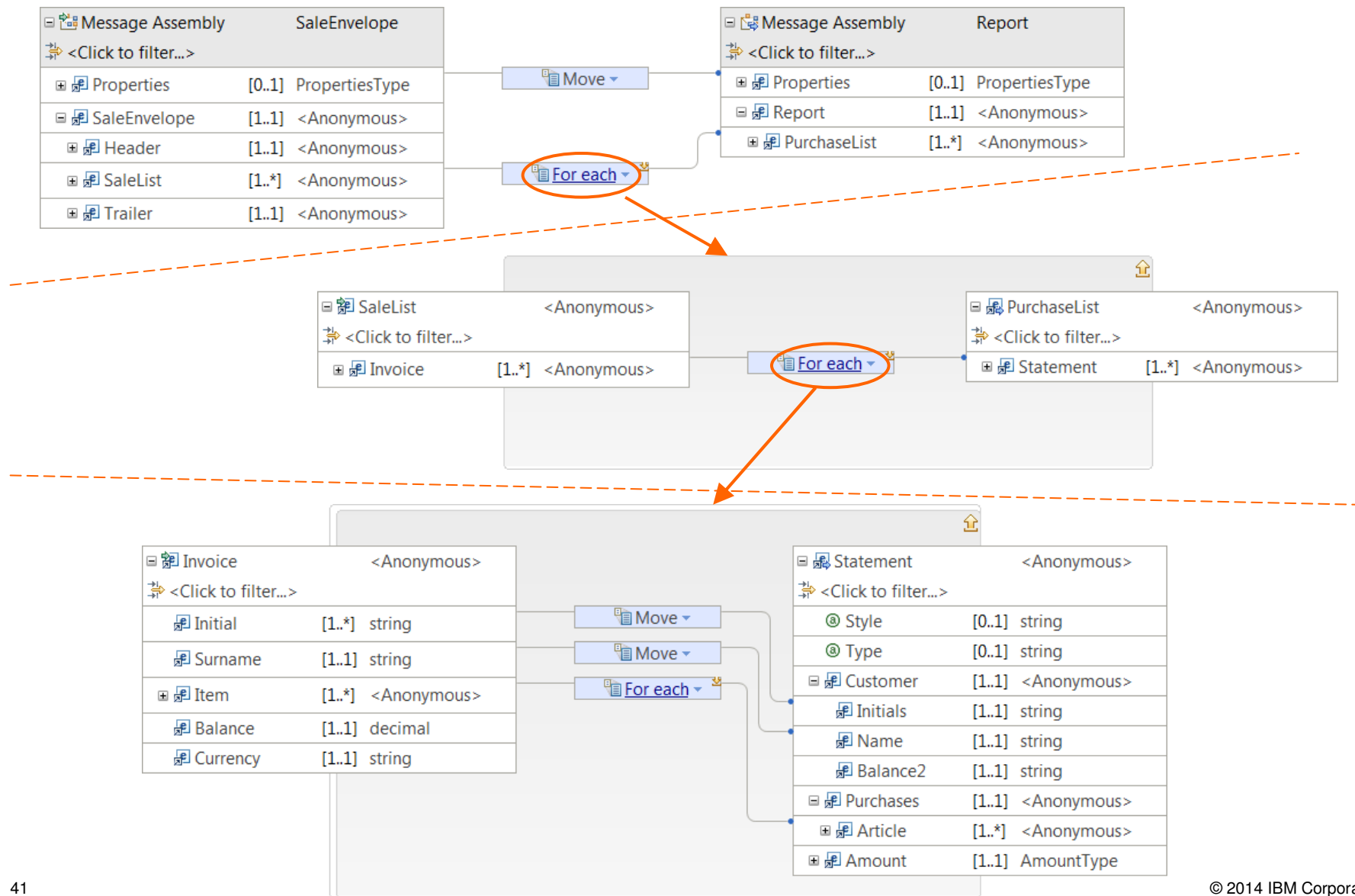
## Conditional mapping

### ▪ If/Else transform

- Allows “else” condition to be mapped as well
- “Grouped transform” containing as many else-if conditions as necessary
- This is a structural mapping
  - Each clause contains a nested map

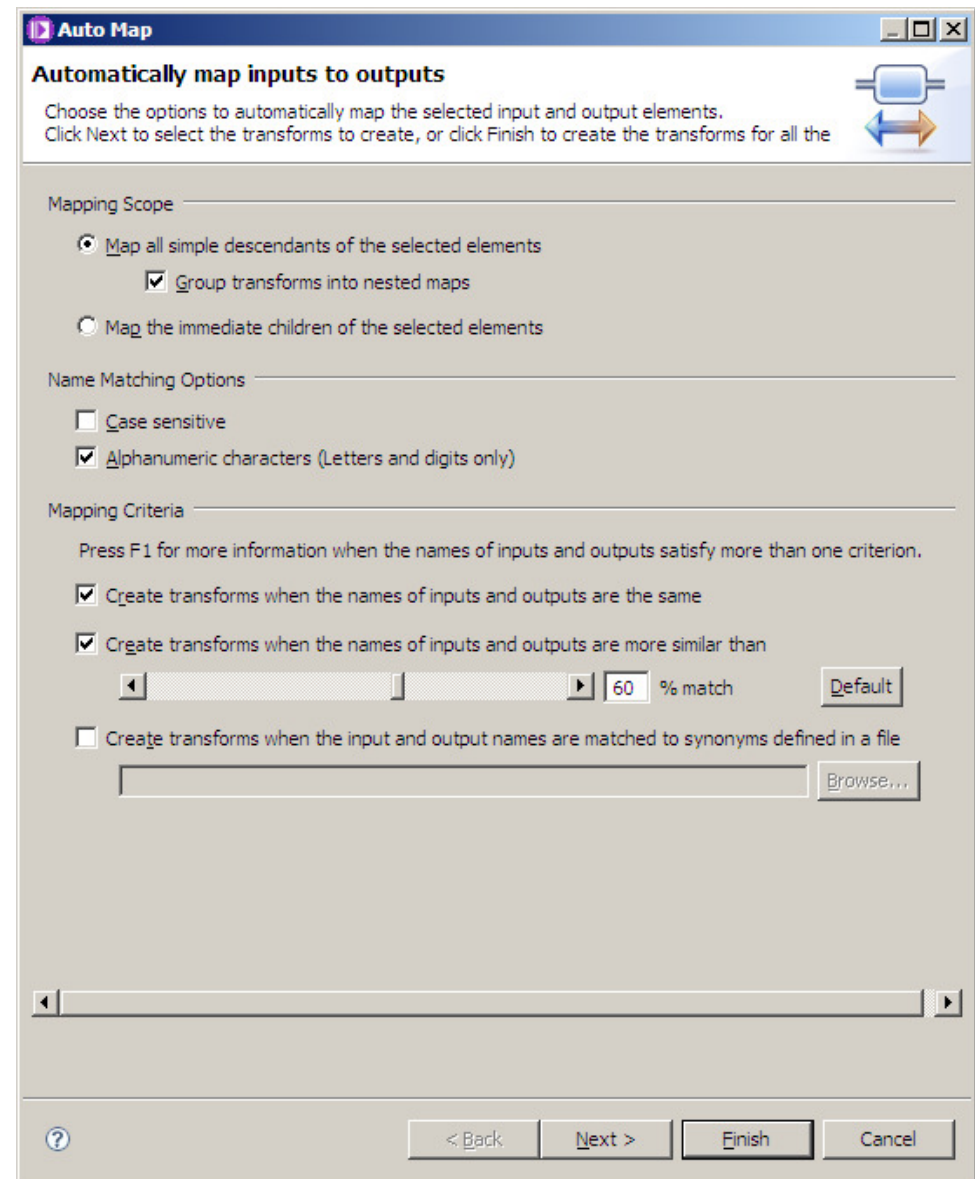


## The nested approach



## Automap

- Automates the task of producing transformations between source and target elements of the same (or similar) names
- Useful for working with large schemas



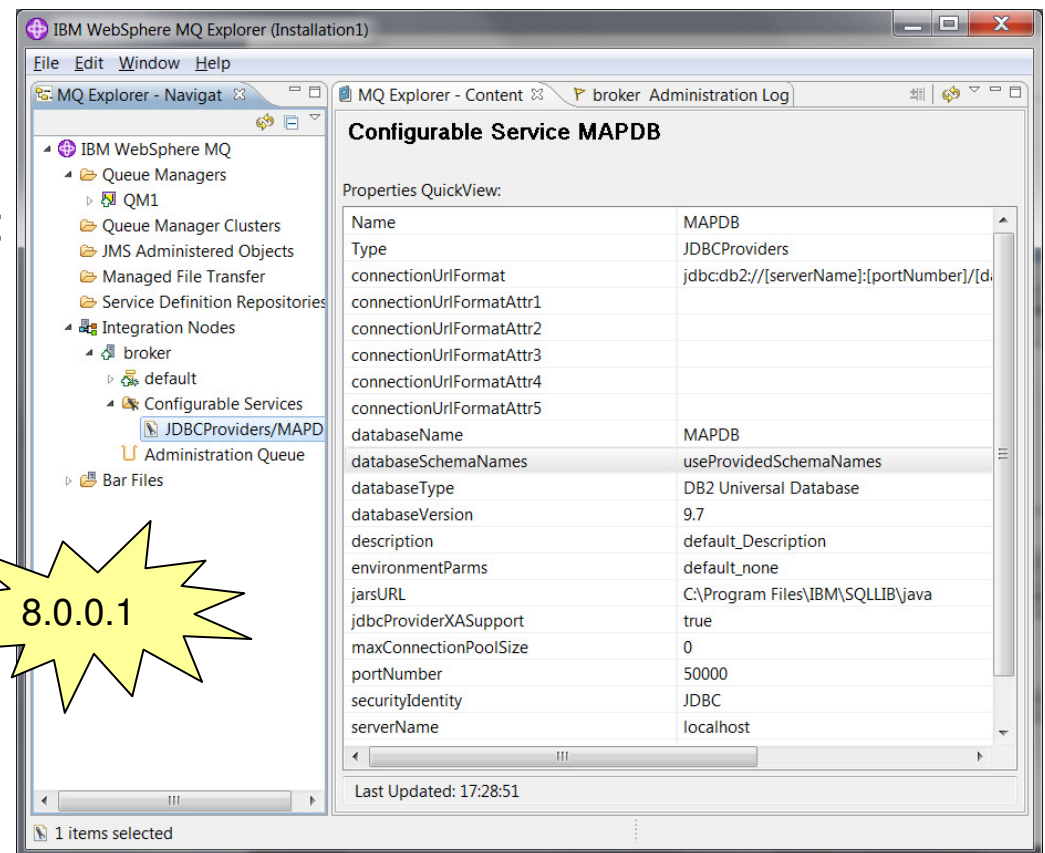
## Database Mapping

- **Mapper can work with data in a relational database**
  - Supports DB Select, Insert, Update, Delete and Stored Procedures
- **Can select fields from DB tables based on data in the input message**
- **Can modify DB tables using values defined in the map**
- **Graphical SQL “WHERE” clause and ResultSet generator**
  - Can contain parameter placeholders to reference the input message tree
  - Parameter values specified using XPath
- **ResultSets are presented as source trees in the map editor**
- **Input parameters are presented as target trees**

## Database mapping – JDBC configuration

- **Create JDBC Configurable Service**
- **Set security credentials**
  - Mqsisetdbparms
- **Toolkit and Runtime both connect to the DB using JDBC**
- **Now possible to specify a different database schema at runtime from the one specified in the map editor**
- **JDBC Configurable Service**
  - databaseSchemaNames property
  - Specifies the database schema to use at runtime for all DB operations or a delimited list of table/schema names
  - If left unset, uses DB default schema name (as for v8 GA mapper)

8.0.0.1



# Database SELECT

**New Database Select**

**Choose a database to select from**  
Select a database available to the map, or obtain a different database.  
MAPDB [Add database...](#)

**Choose the columns to include**  
You must choose at least one column.

- ACOLEMAN
  - BOOKS
    - ☒ ISBN
    - ☒ TITLE
    - ☐ COPIES
  - CUSTOMERS
  - LOANS
  - TYPES
  - TEST.DOT
  - TEST?QUESTION
  - BOOKS2

**Define a where clause**  
The where clause is used to extract only those rows that fulfill a specified condition, which is often the value of a key column in the database table. The value can come from other inputs in the map. The expression must evaluate to a boolean.

**Table columns**

- ACOLEMAN
  - BOOKS
    - ISBN
    - TITLE
    - COPIES

**Operators**

- AND
- OR
- NOT
- =
- <>
- >
- <
- >=
- <=
- BETWEEN
- LIKE
- IN

**Available inputs for column values**

- \$loan
  - customerId
  - isbn
  - return
- \$dbselect1
  - ResultSet
  - \$loan-index

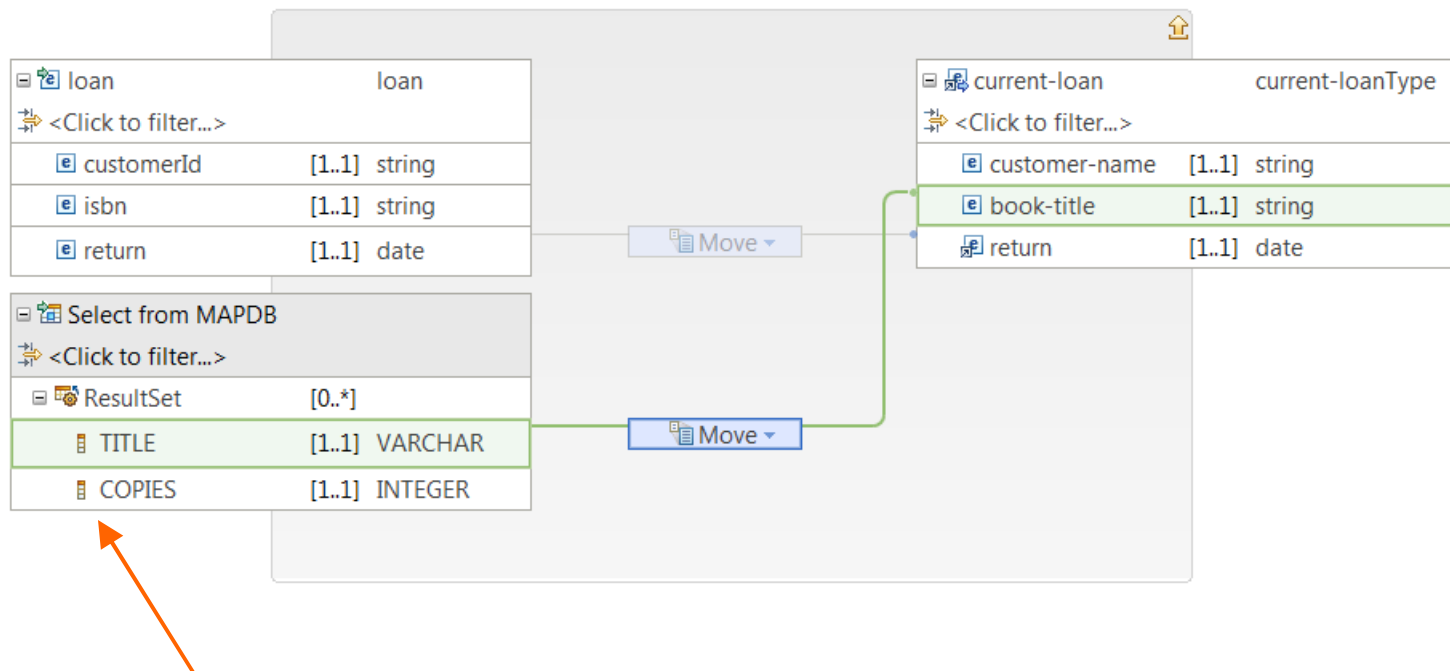
**SQL where clause**  
ACOLEMAN.BOOKS.ISBN = ?

Plac...	XPath expression	Edit...
?	\$loan/isbn	

**Classify SQL warning**  
If checked, the first SQL operation resulting in a database warning will be treated as an error, and an exception will be thrown leading to the "Failure" transform, if present, being invoked to process the exception.  
☐ Treat warning as error

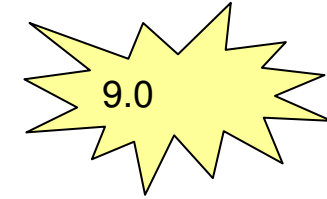
OK Cancel

## Database SELECT



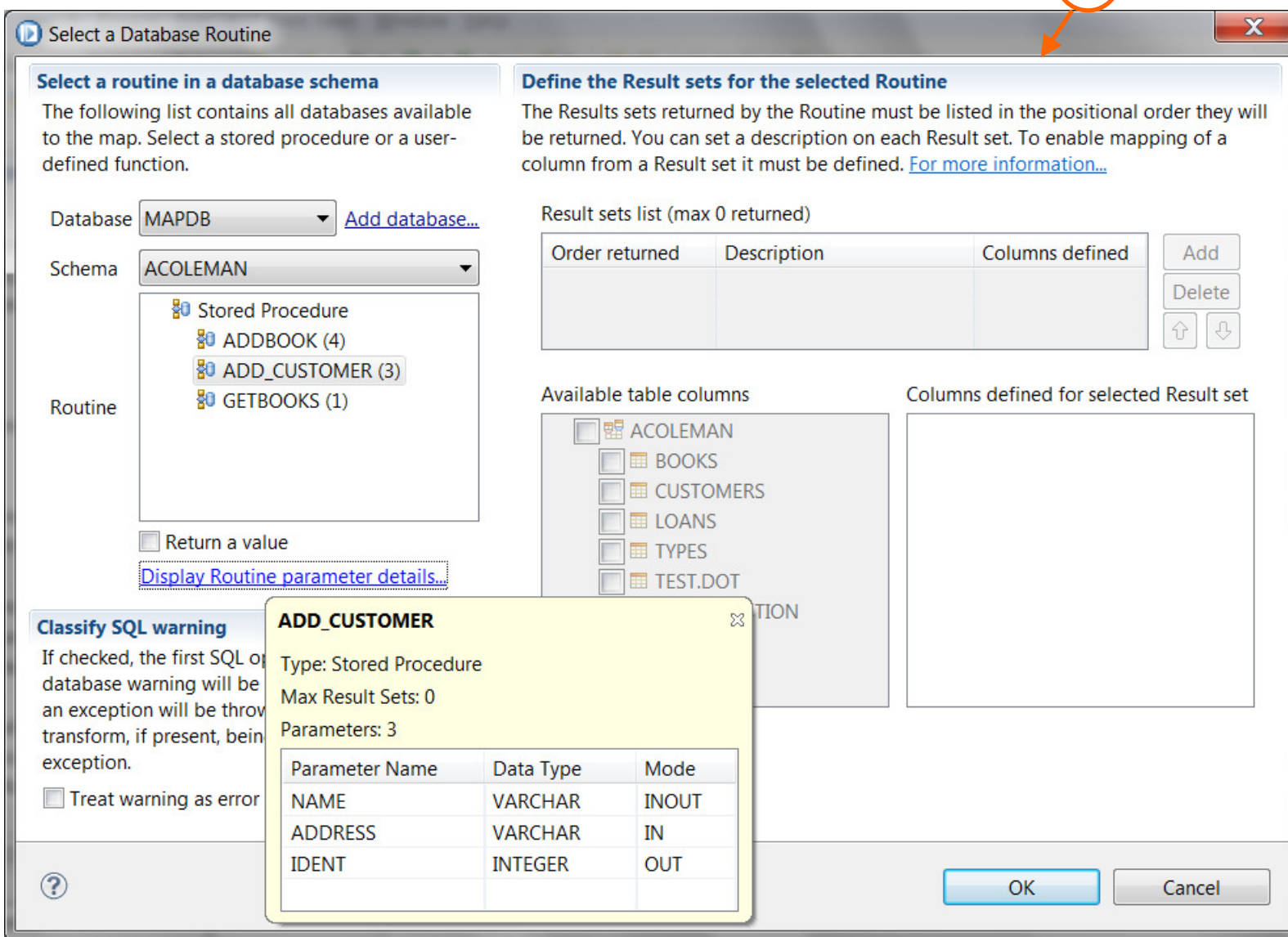
Source tree representing  
The DB Select result set

## Database Stored Procedures



- **Invoke a database Stored Procedure**
- **Presented as a “complex” transform (function)**
- **Tools to discover Stored Proc metadata**
- **Presents “IN” and “INOUT” parameters as target tree in nested map**
  - Wire inputs to stored procedure
- **“INOUT”, “OUT”, ResultSet(s) and Return value as source tree in nested map**
- **Supports DB2 (GA), Oracle (soon), SQL Server (soon)**

# Database Stored Procedures



# Database Stored Procedures

**Select a Database Routine**

**Select a routine in a database schema**  
The following list contains all databases available to the map. Select a stored procedure or a user-defined function.

Database: **MAPDB** [Add database..](#)

Schema: **ACOLEMAN**

Routine:

- Stored Procedure
  - ADDBOOK (4)
  - ADD\_CUSTOMER (3)**
  - GETBOOKS (1)

☐ Return a value

[Display Routine parameter details..](#)

**Define the Result sets for the selected Routine**  
The Results sets returned by the Routine must be listed in the positional order they will be returned. You can set a description on each Result set. To enable mapping of a

```
CREATE PROCEDURE ADD_CUSTOMER ( INOUT NAME VARCHAR(20),
                                IN ADDRESS VARCHAR(50),
                                OUT IDENT INTEGER )
P1: BEGIN
    set ADD_CUSTOMER.IDENT = (
        select id from new table (
            insert into customers (name, address)
            values (ADD_CUSTOMER.NAME, ADD_CUSTOMER.ADDRESS)
        )
    );
    SET ADD_CUSTOMER.NAME = UPPER(ADD_CUSTOMER.NAME);
END P1
```

**Classify SQL warning**  
If checked, the first SQL of database warning will be an exception will be thrown transform, if present, being exception.

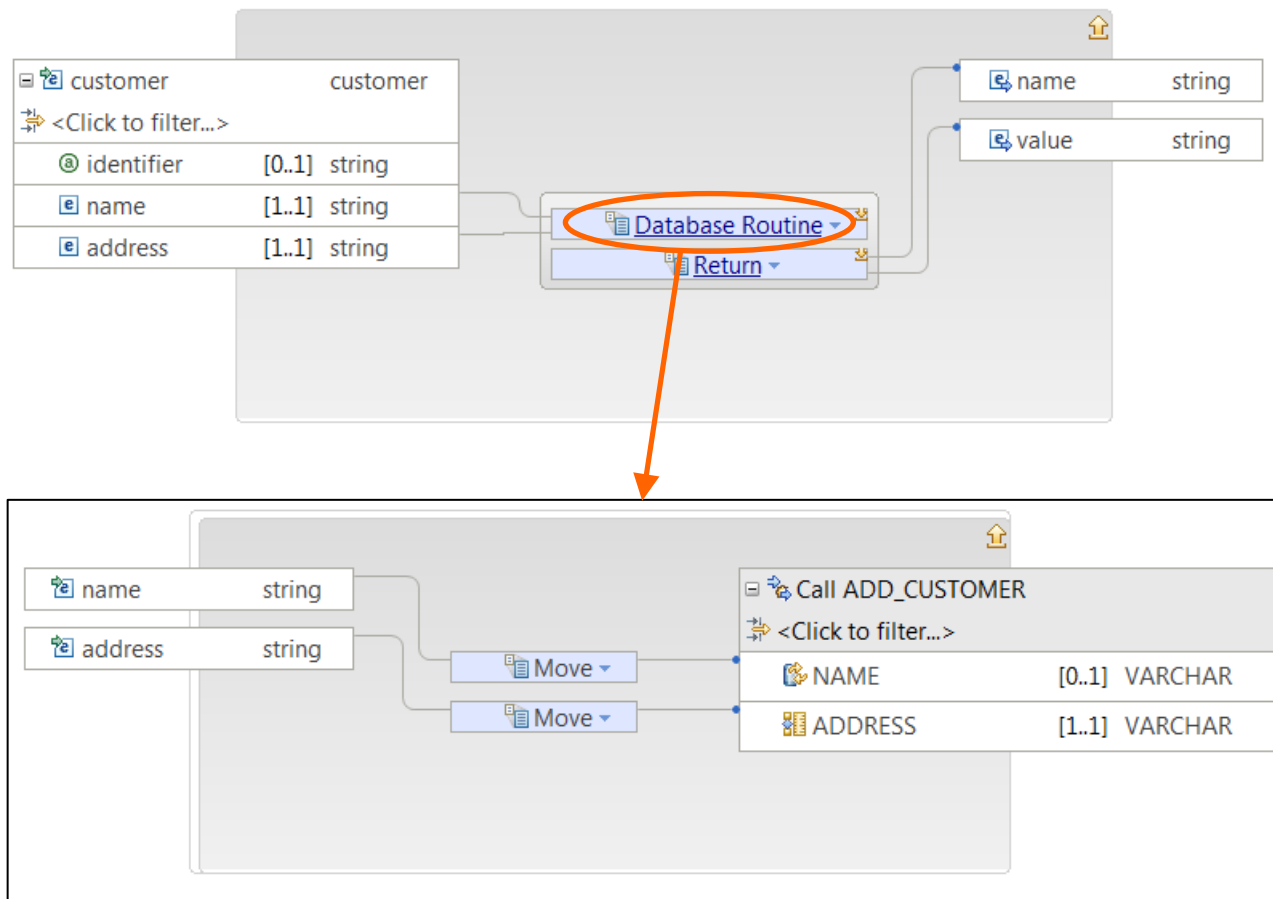
☐ Treat warning as error

**ADD\_CUSTOMER**  
Type: Stored Procedure  
Max Result Sets: 0  
Parameters: 3

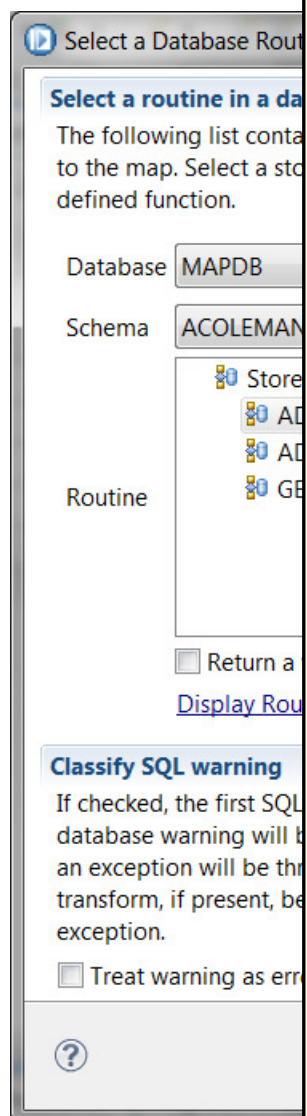
Parameter Name	Data Type	Mode
NAME	VARCHAR	INOUT
ADDRESS	VARCHAR	IN
IDENT	INTEGER	OUT

OK Cancel

## Database Stored Procedures



## Stored Procedures – Returning ResultSet(s)



```
CREATE PROCEDURE ADDBOOK ( IN pISBN CHARACTER(32),
                           IN pTITLE CHARACTER(128),
                           INOUT pCOPIES INTEGER,
                           OUT pDUPLICATE BOOLEAN )
DYNAMIC RESULT SETS 2
p1: BEGIN
  DECLARE cursor1 CURSOR WITH RETURN FOR
    SELECT TITLE, ISBN, COPIES
    FROM BOOKS2
    WHERE ISBN = ADDBOOK.pISBN;

  DECLARE cursor2 CURSOR WITH RETURN FOR
    SELECT TITLE, ISBN, COPIES
    FROM BOOKS2;

  merge into BOOKS2 using
    table (values (ADDBOOK.pISBN, ADDBOOK.pTITLE, ADDBOOK.pCOPIES))
    as tBOOK (ISBN, TITLE, COPIES)
    on BOOKS2.ISBN = tBOOK.ISBN
  when matched then
    update set COPIES = COPIES + tBOOK.COPIES
  when not matched then
    insert (ISBN, TITLE, COPIES)
    values (tBOOK.ISBN, tBOOK.TITLE, tBOOK.COPIES);

  select COPIES INTO pCOPIES from BOOKS2 WHERE ISBN = ADDBOOK.pISBN;
  set pDUPLICATE = true;

  OPEN cursor1;
  OPEN cursor2;
END p1
```

## Version 7 maps



- **Version 7 maps can be viewed in Version 8/9 toolkit**
  - Read-only – cannot be edited
- **Version 7 maps can still be executed in Version 8/9 GA runtime**
  - Converted in the toolkit into an ESQL Compute node
  - Executed in the ESQL runtime engine
- **Can “convert” V7 maps to V8 maps (requires version 8.0.0.1)**
  - .msgmap -> .map file format conversion
  - Can then be opened in V8 mapping editor and modified
  - Will then be executed in the V8 mapping runtime engine
- **“Assisted Convert”**
  - Fundamentally different technologies
  - Cannot guarantee 100% accurate “migration”
  - Inserts annotations or “Task” markers to prompt user review or fix up

## It's time for Labs 1, 2 and 3!

- Applications and Libraries
- DFDL message model tooling
- Using databases with the Graphical Data Mapper



# Decision Services



## Combine the strengths of IIB and ODM for enhanced solutions

### IIB

- *Extreme reliability*
- *Fast and flexible application integration*
- *Ability to integrate disparate systems and technologies*
- *Reduced integration costs*

*Integration and data enrichment*

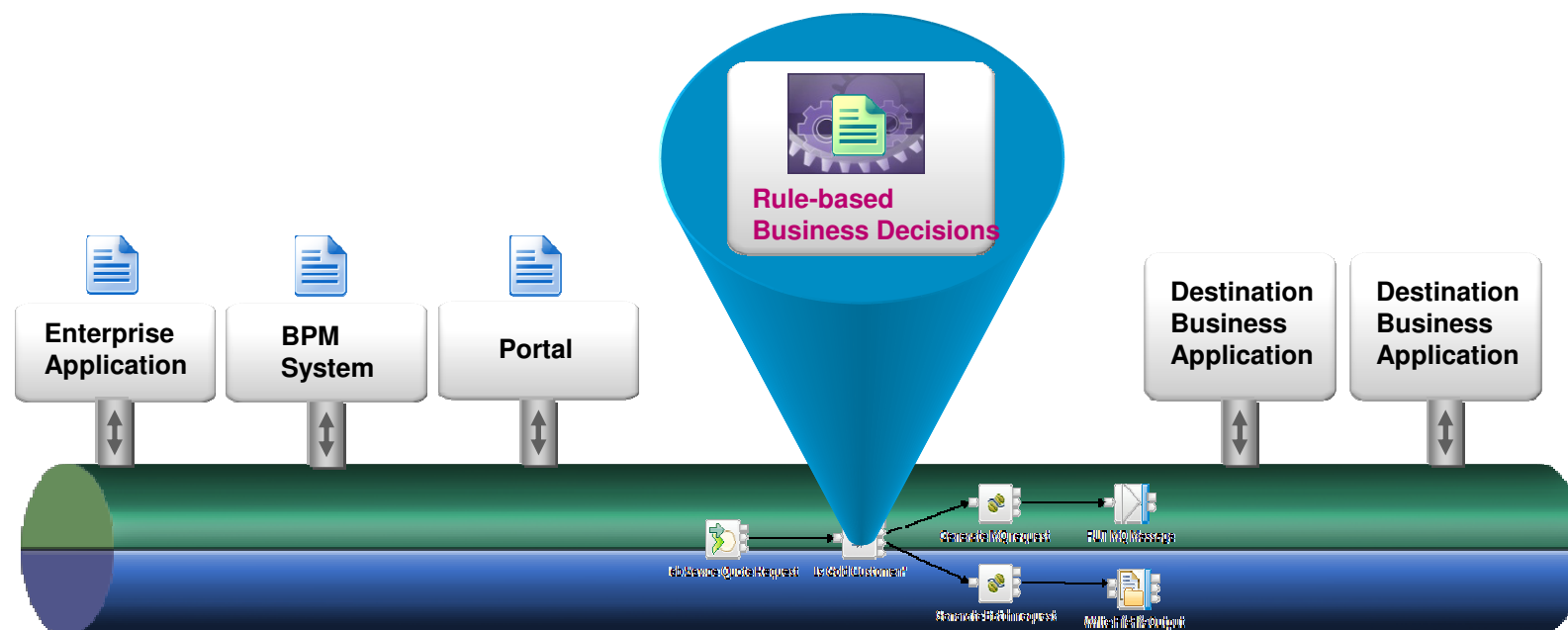


### ODM

- *Use natural language rules for easier authoring and better business / IT alignment*
- *Reduced lead time for rule changes to decisions dealing with business content*
- *Rule governance*
- *High performance and reliability*

*Manage business decisions*

## Transformation, dynamic routing and validation

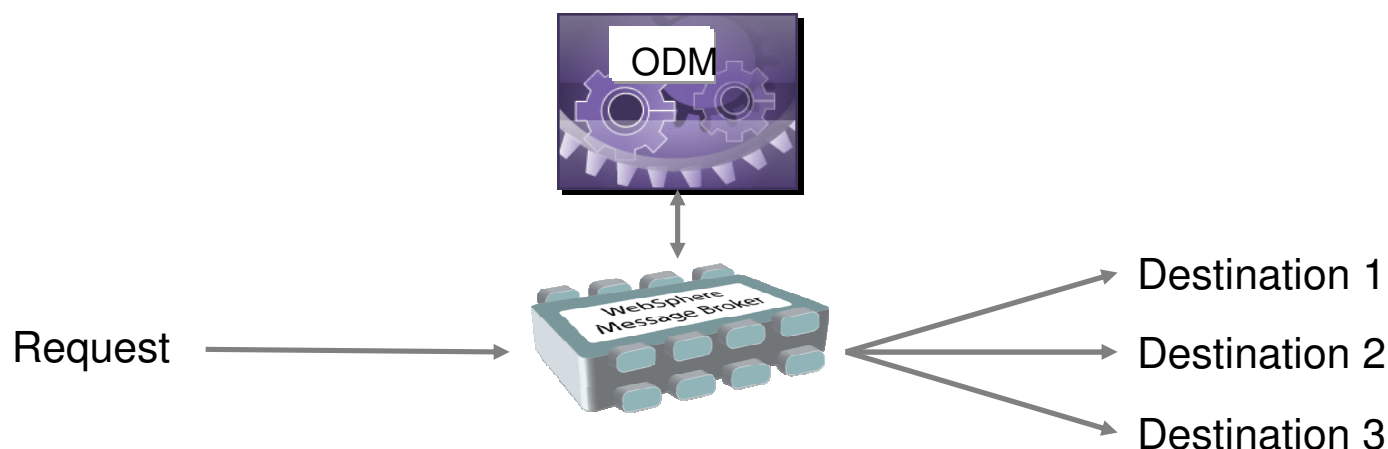


**Clients want ODM and Integration Bus deployed together to maximize performance and minimize latency :**

- Message Broker v7, v8 had IAM9 Support Pack with ODM v7.5, V8, V8.5
- NEW Releases of IIB v9 and ODM v8.5 greatly enhance this with no need for SupportPacs

## Smart dynamic routing

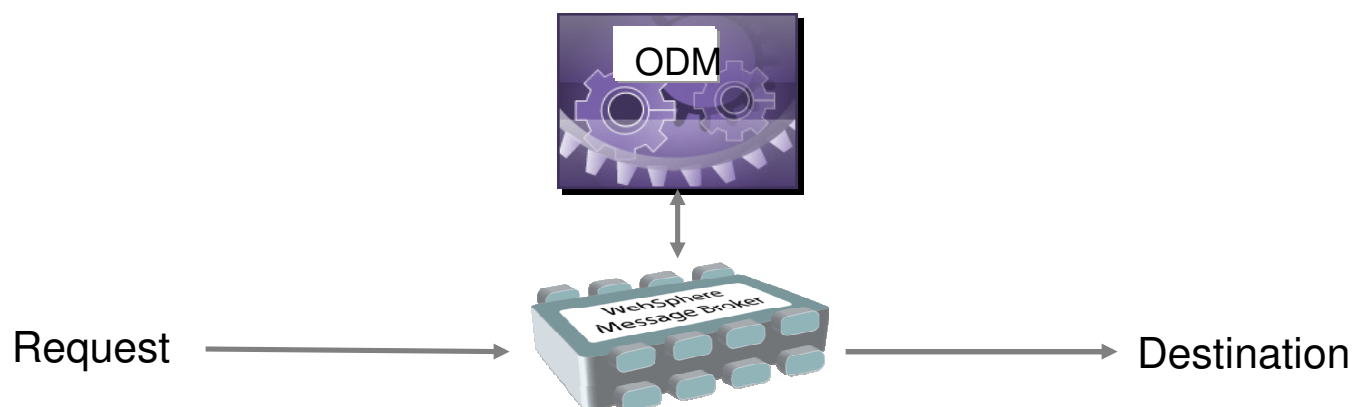
Use Business Decisions to provide business level routing based on message content



- Least cost routing
  - Using business metrics and message content, choose the destination that imposes the least cost to the business while maintaining service level agreements
- Route to appropriate destination
  - Analyse the message content and route to the destination best suited to fulfil the request based on business rules

## Business-based message validation

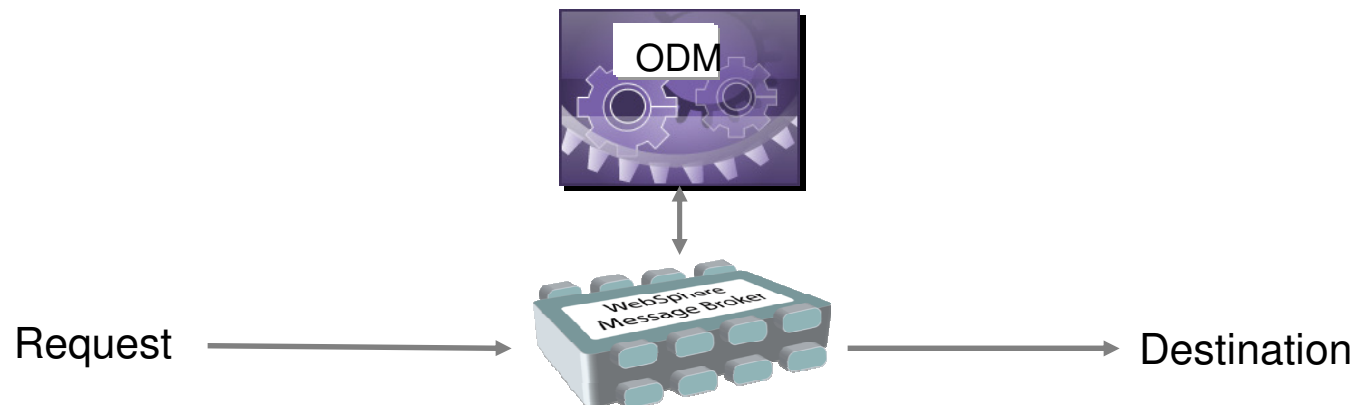
Use Business Decisions to provide centralized business level validation of message content



- Message validation
  - Perform complex validation of content of large documents based on business defined rules
- Perform eligibility checks
  - For example, check that a received insurance claim is eligible for processing

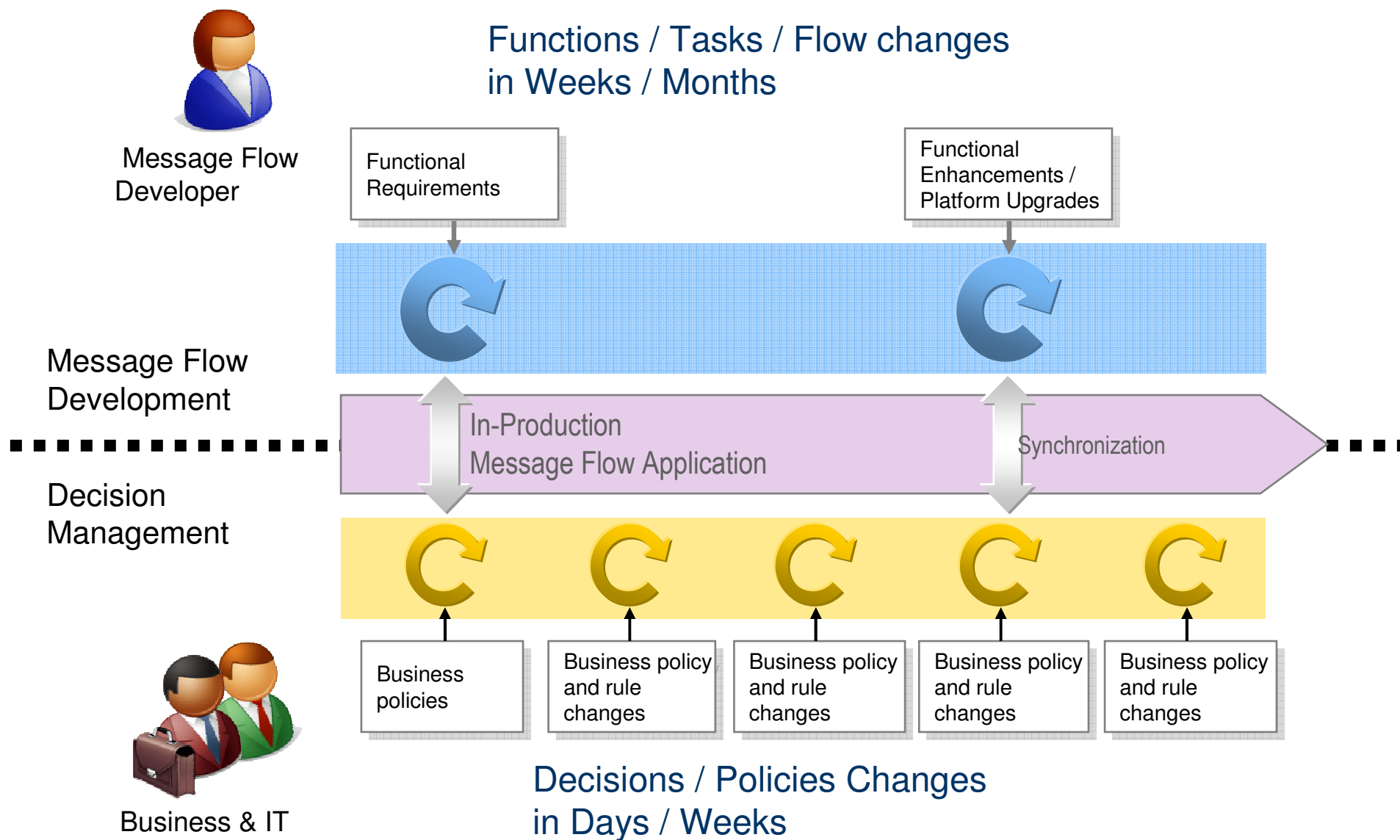
## Business-based message augmentation

Use Business Decisions to provide additional information in messages based on business rules

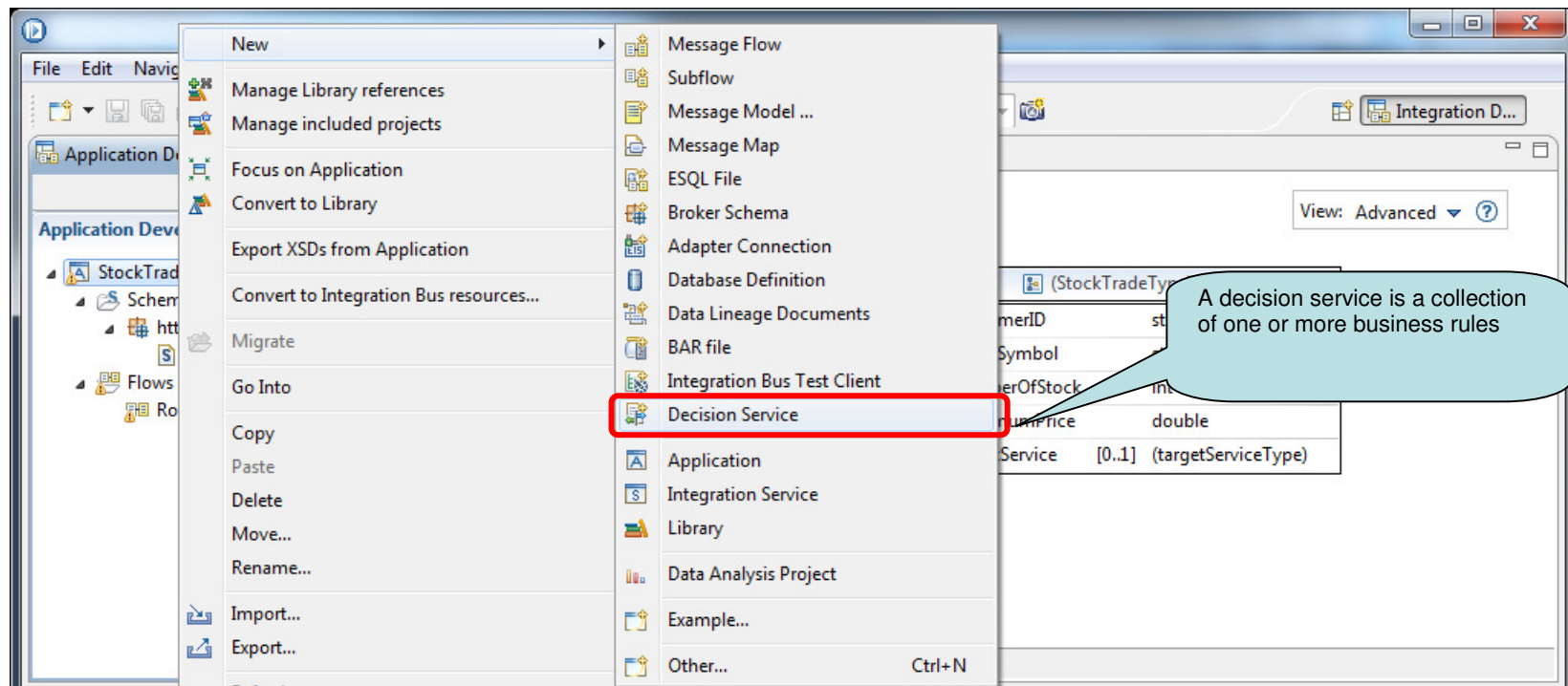


- Message Augmentation
  - Use business rules to augment message content with information stored in decision tables
- Intelligent Data Mapping
  - When there is no standard mapping between the content of two message formats, use IBM ODM to more quickly capture and apply the business rules required to perform the mapping

## Separate the IIB and ODM lifecycles



## Stage 1: Define the initial business rule/decision service



## Wizard guided task to generate a new decision service

**Create a decision service**

A decision service is a...

Container: ...

Decision se...

**Decision Service Parameters**

Use the table below to customize the parameters available to the decision service.

Name	Type	Direction	Verbalization
StockTrade	StockTrade {http://www.ibm.com/demo}	INOUT	the stock trade

**Parameters**

Manage the parameters of the decision service.

- Name:** Specify a unique name for the parameter.
- Type:** Select a global element, global type, or simple type. The selected item's type will be used as the parameter type.
- Direction:** The direction of the parameter: IN, OUT, INOUT. Currently only INOUT is supported for decision services authored in the IBM Integration toolkit.
- Verbalization:** Specify a natural language name (or alias) for the parameter; for example, "the customer". This value is used to refer to the parameter when writing a rule.

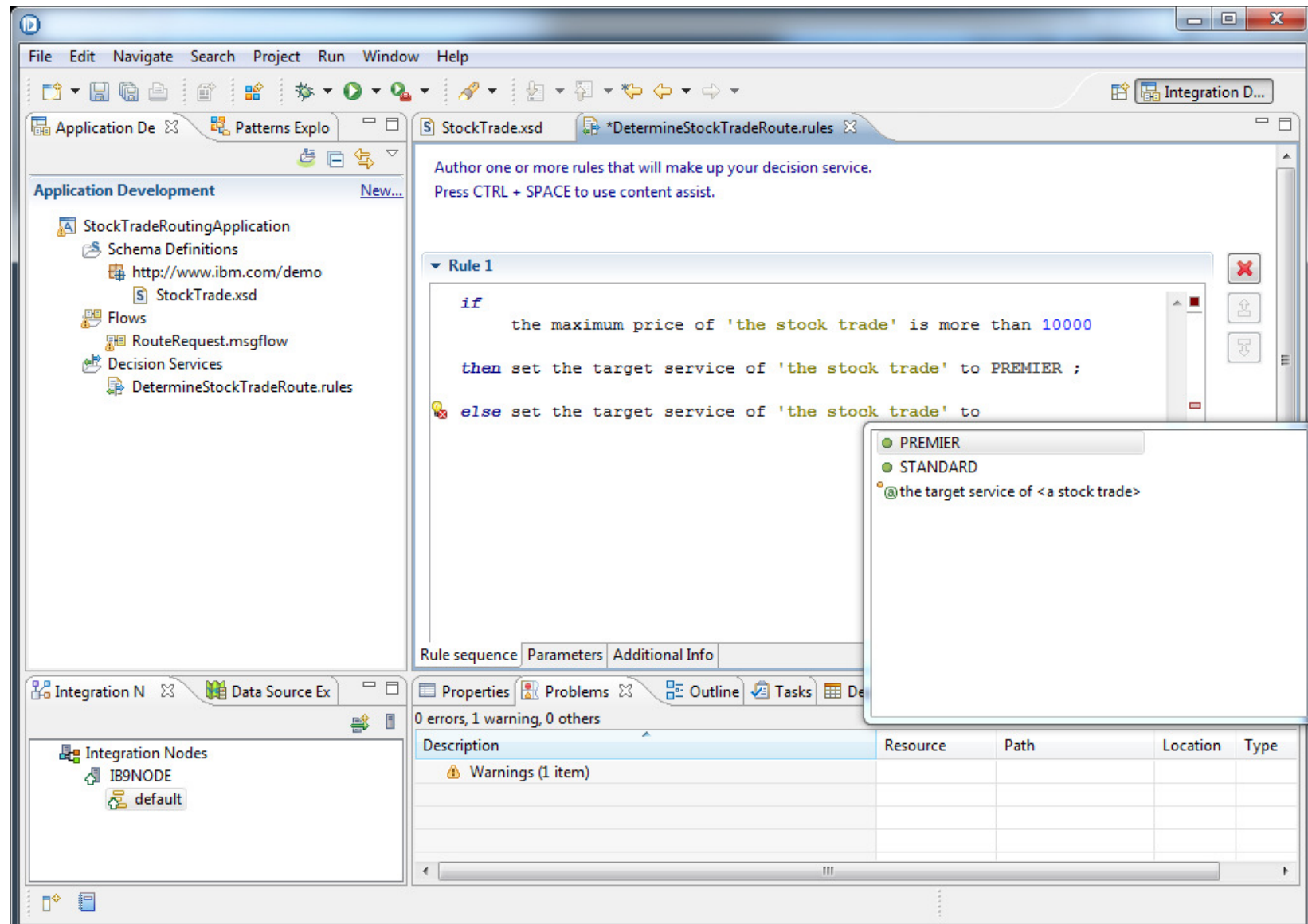
For example:  
Name: myCustomer Type: CustomerType Verbalization: the customer

To add one or more parameters, click on the 'Add parameters' button to bring up the selection dialog.

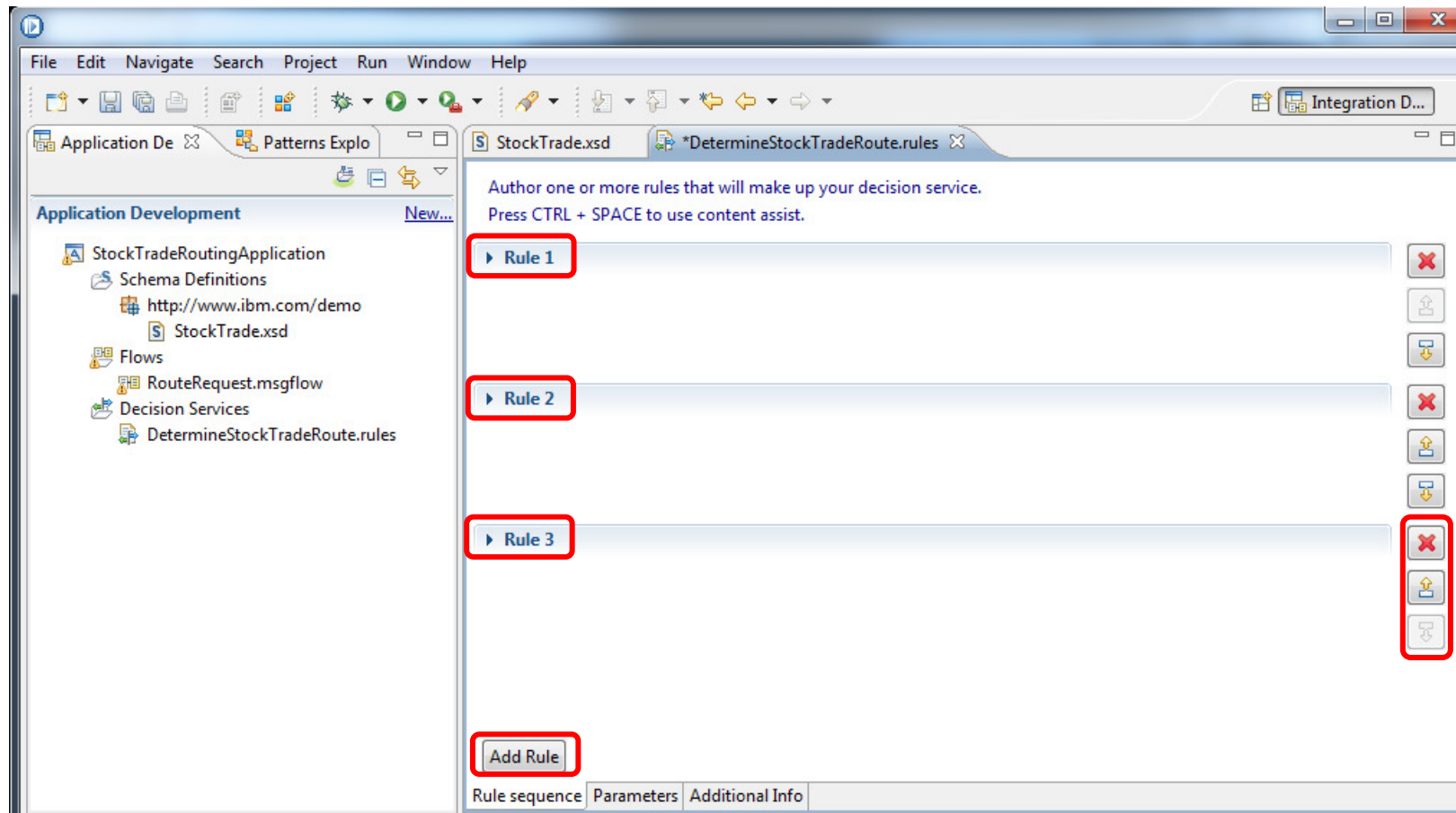
To delete a parameter, place the mouse cursor in a table cell, and click on the 'Delete parameter' button.

To edit a value, click the cell in the table. For the "Name" and "Verbalization" cells, type a value; for the "Type" cell, select a value from the selection dialog.

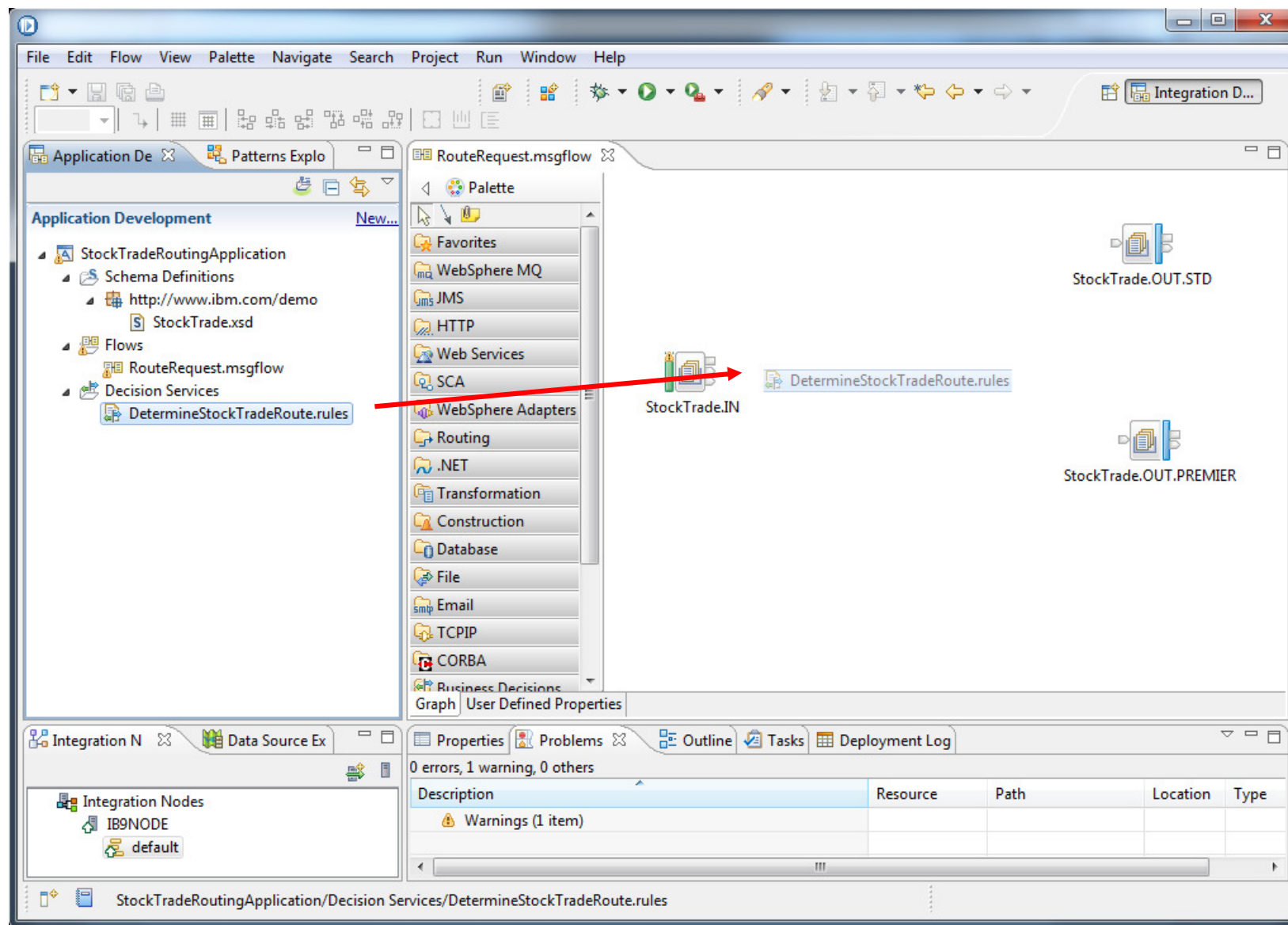
## Content assisted editor to author business rules



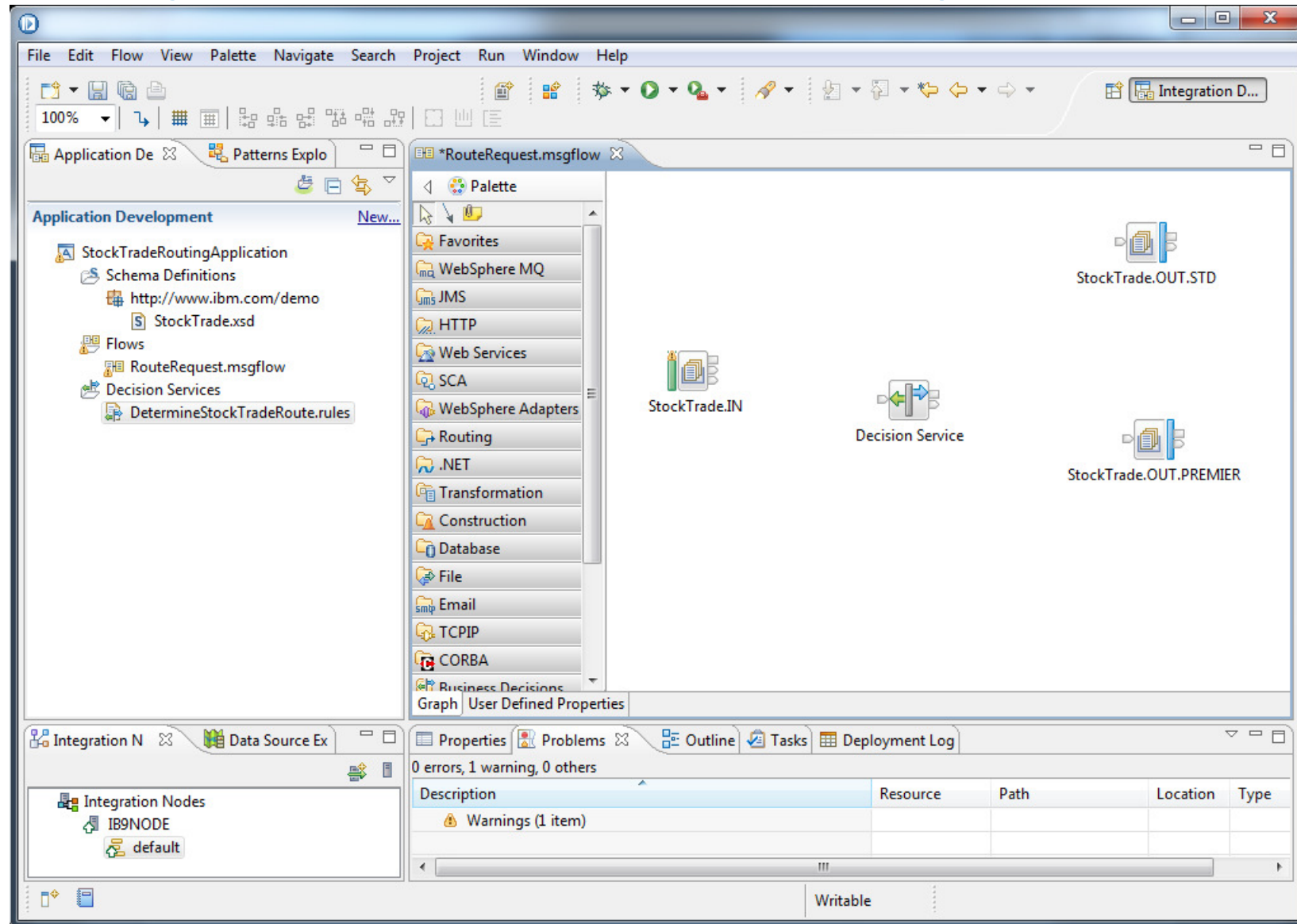
## Decision services can contain multiple rules...

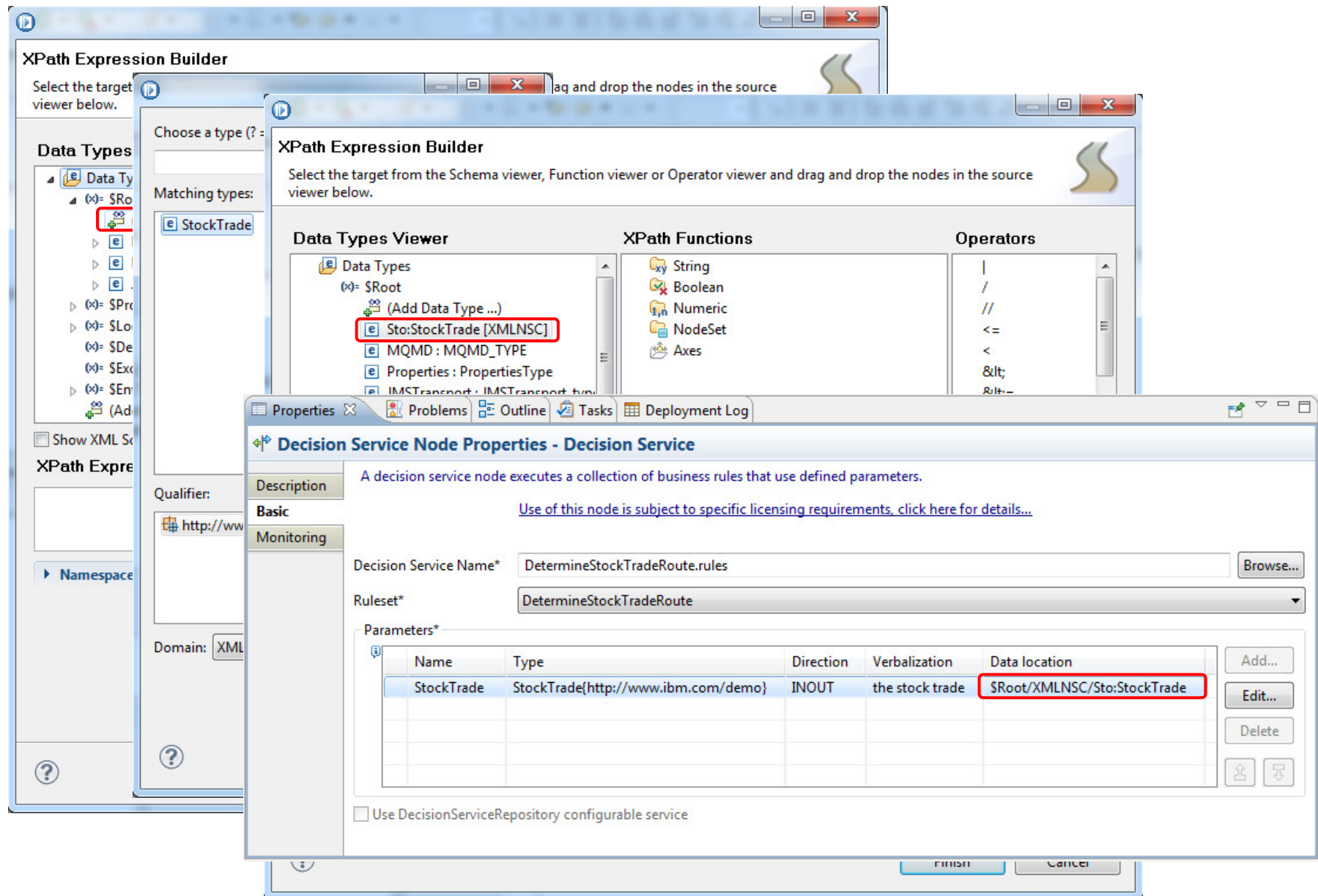


## Embedding the decision service within a message flow

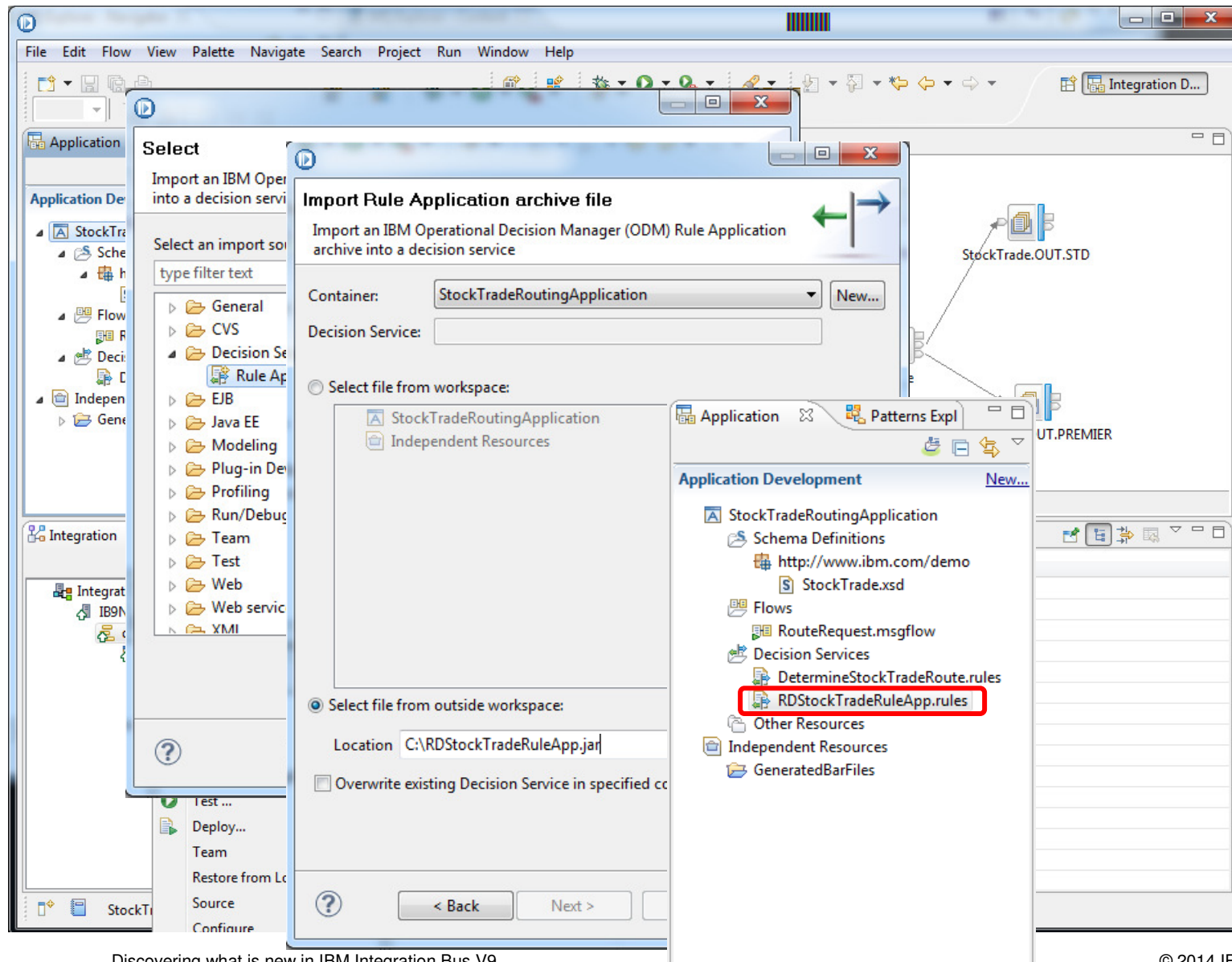


## Embedding the decision service within a message flow





## Import an existing decision service



# Intelligent Rule Editor

The screenshot displays the IBM Decision Center Intelligent Rule Editor. The interface includes a top navigation bar with 'HOME' and 'LIBRARY' links, and a user profile 'cindy'. The main workspace shows a rule titled 'Aquisition Promotion for NJ (v1.0)' under the 'Pricing > main' category. The rule is written in a natural language syntax, using 'if' for conditions and 'then' for actions. A dropdown menu for the action 'add a 0 % surcharge to' is open, showing suggestions like 'Auto Quote Response' and 'the coverage quote'. A callout box labeled 'Natural language syntax' points to the rule's text. Another callout labeled 'Automatic completion' points to the dropdown menu. A third callout labeled 'Inline error detection' points to the error messages at the bottom of the editor.

**if**  
the state of residence of **the driver** is "NJ"  
**and** **the driver** has never had their license suspended or revoked  
**and all of the following conditions are true :**  
- the number of accidents **the driver** has been involved in equals 0  
- the number of traffic tickets **the driver** has received is 0  
- **the driver** has completed a drivers education course ,  
**then**  
**emit** Offer promotion to retain customer with reason: "Increase market share for good NJ drivers" ;  
add a 0 % surcharge to *<an auto quote response>* , reason: *<a string>*

**Automatic completion**

- 'Auto Quote Response'
- 'the coverage quote'

**Inline error detection**

Severity	Line	Message
✖	1	The rule is incomplete, fill all the placeholders.
✖	11	The word ',' is missing.

# Decision Table Editor

IBM Decision Center HOME LIBRARY cindy

Pricing > main > Collision Price Table NY (v1.2) ★ ⓘ

End Edit Details

1 - 16 | 16 - 18 | All

**Rule**

**if**

all of the following conditions are true :

- ( the value of 'the vehicle' is more than \$ 5000 and at most \$ 10000 )
- ( the deductible of 'the coverage' is \$500 ) ,

**then**

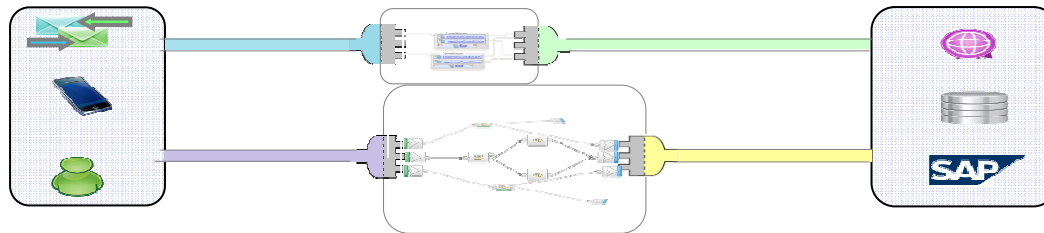
set base premium for 'the coverage quote' to \$ 110 ;

**Easy navigation across multi-row tables**

**Equivalent action rule**

	Vehicle Value		Deductible	
	Lower	Upper		
1			\$250	\$ 100
2	\$ 0	\$ 5,000	\$500	\$ 90
3			\$1000	\$ 85
4			\$250	\$ 120
5	\$ 5,000	\$ 10,000	\$500	\$ 110
6			\$1000	\$ 100
7			\$250	\$ 130
8	\$ 10,000	\$ 20,000	\$500	\$ 120
9			\$1000	\$ 110
10			\$250	\$ 140
11	\$ 20,000	\$ 30,000	\$500	\$ 130
12			\$1000	\$ 120
13			\$250	\$ 155
14	\$ 30,000	\$ 50,000	\$500	\$ 145
15			\$1000	\$ 140
16	\$ 50,000	\$ 100,000	\$250	\$ 170

# Integration Services



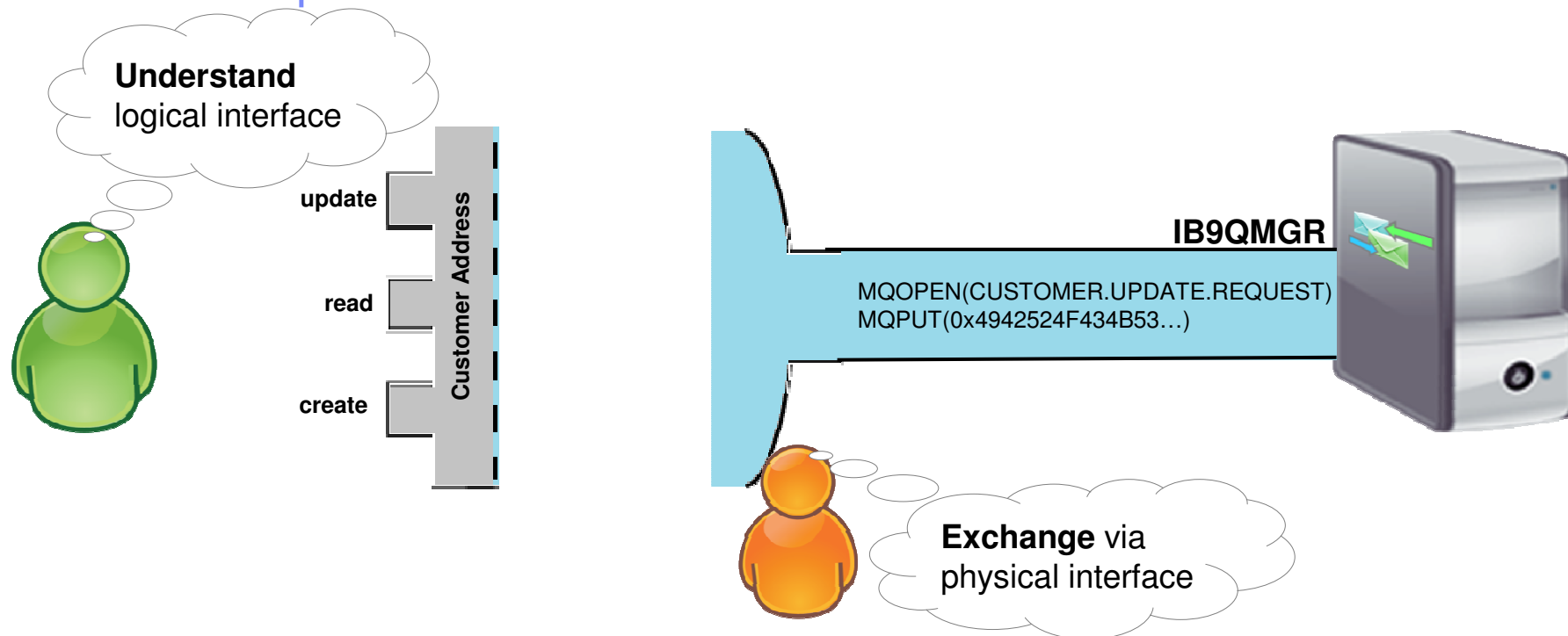
## Service discovery



**Service discovery provides a common experience for describing service interfaces.**

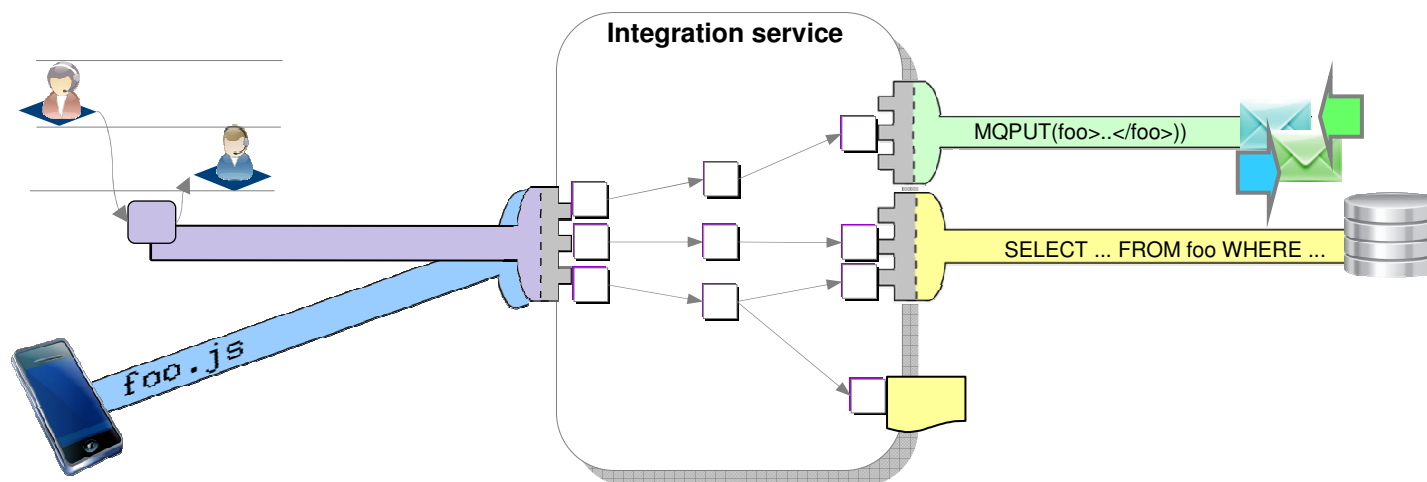
- Interrogate IT systems for definitions that can be discovered
  - Data definitions, function declarations and communication objects
- User selects, elaborates and refines
- Service is described in the common model

## Service description



- The service description can be shared with different tools and users
- Allows users to:
  - **Understand the interface:**  
Logical description of available business objects and operations
  - **Connector to exchange:**  
Technical configuration describes real systems' connection details and physical exchange formats

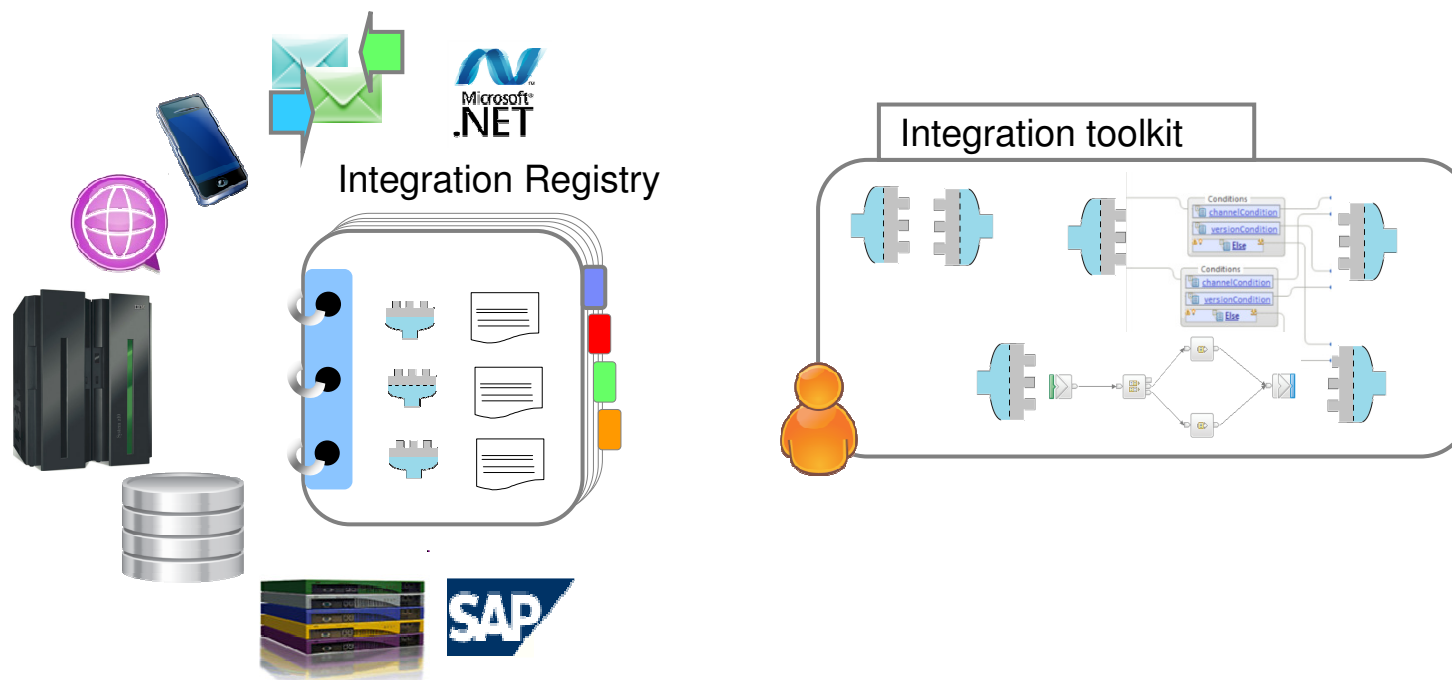
## Integrating services



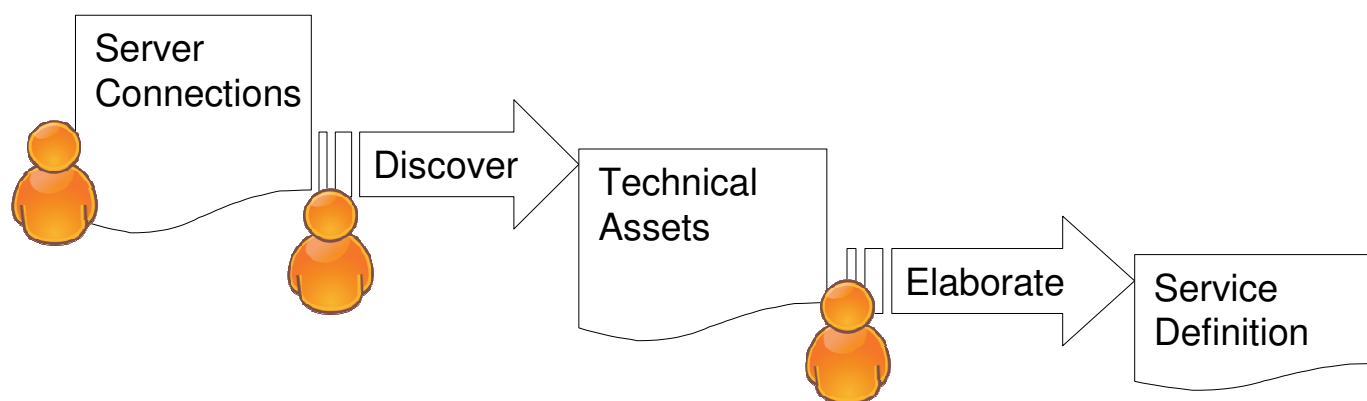
- **Integration services are ready for the consumer**
  - Logical interface can be understood by the consumer
  - Physical connector is appropriate for the consumer's environment
- **Role of integration is relative**
  - From a consumer's perspective, the integration service *is* the service
  - From the back office system's perspective, integration is a consumer of the service
- **Integration tools have a description of every service**
  - Common model for all types of service
  - Discovery translates from consumer or provider's specific description
- **Providing an integration service requires**
  - Service description
  - Implementation (flows, maps)
- **Consuming a service from an integration requires:**
  - Service description
  - Access method ( node, procedure signature, service map)
- **Not everything is a service (for example, a file)**

## Integration Registry

- **Service descriptions (and WLM Policies) can be published to the Integration Registry**
  - Facilitates collaboration and re-use
  - Integration Registry is hosted by the integration node
- **Populated by:**
  - Publishing of discovered services (MQ Services) from Toolkit
  - Publishing of WLM Policies
- **Integration Registry is available from the Integration Toolkit and Web UI**



## Discovery workflow

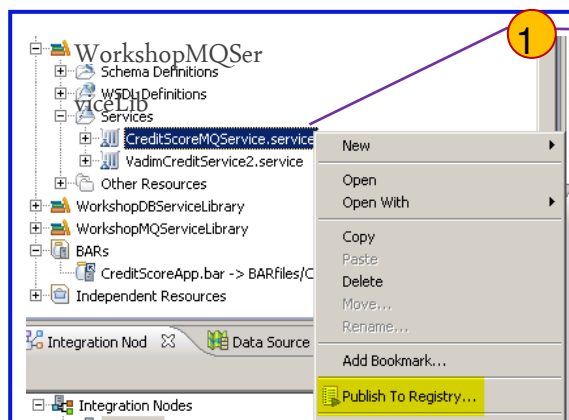


- **User enters connection details**
- **Connector discovers technical assets**
  - Scheduled or interactive
  - White box or masked
    - User may configure the discovery step to omit irrelevant technical assets
- **Technical assets discovered**
  - Interaction points (queues, programs)
  - Data Objects (tables, IDOCs)
- **User selects technical assets for elaboration**
  - Selection task assisted by filtering, type ahead, browse, search and so on
  - User elaborates definition of technical assets
- **Service definition created and stored in a catalog**
  - Can be used to assist with message flow development
  - Provides policy attachment points

# Publishing service to the integration registry

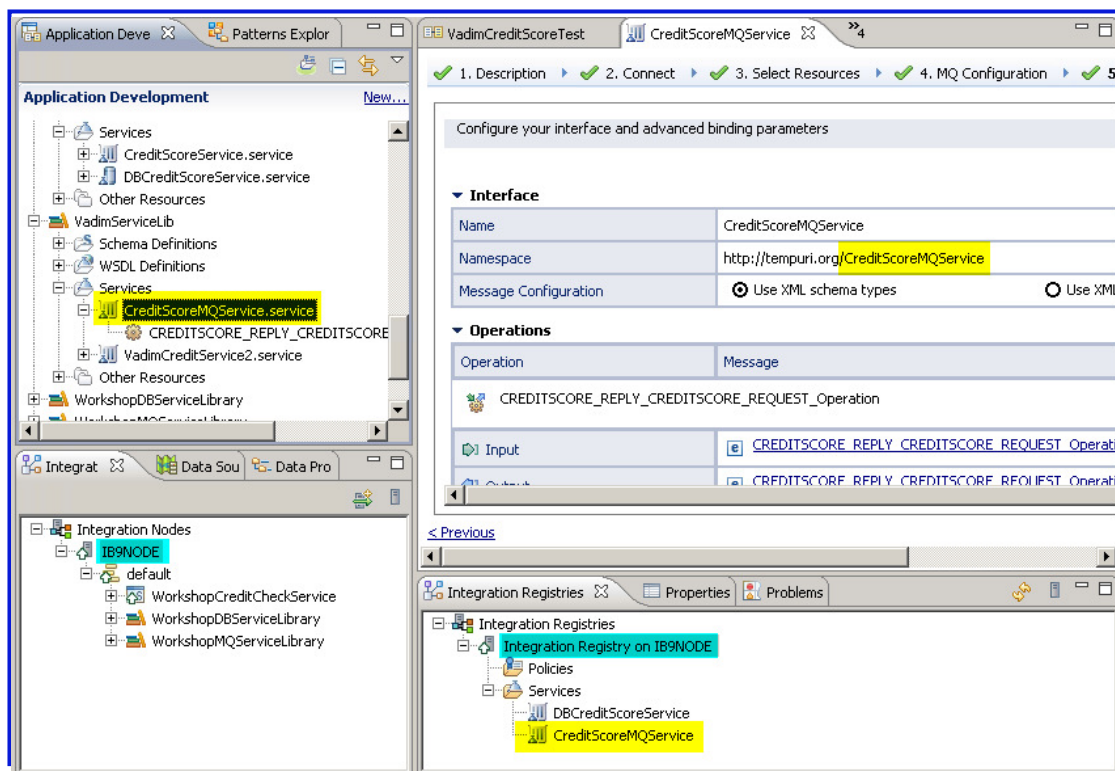
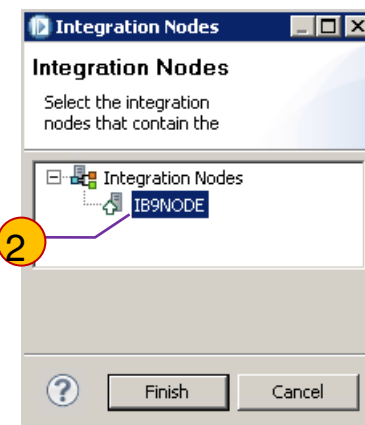


Integration Developer



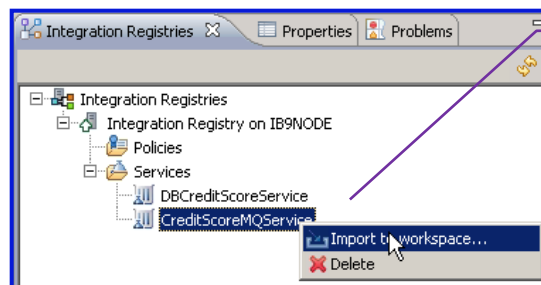
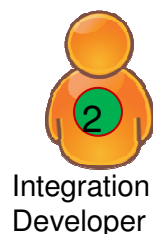
"Publish" discovered service definition to the integration registry

Select integration node of interest that hosts integration registry



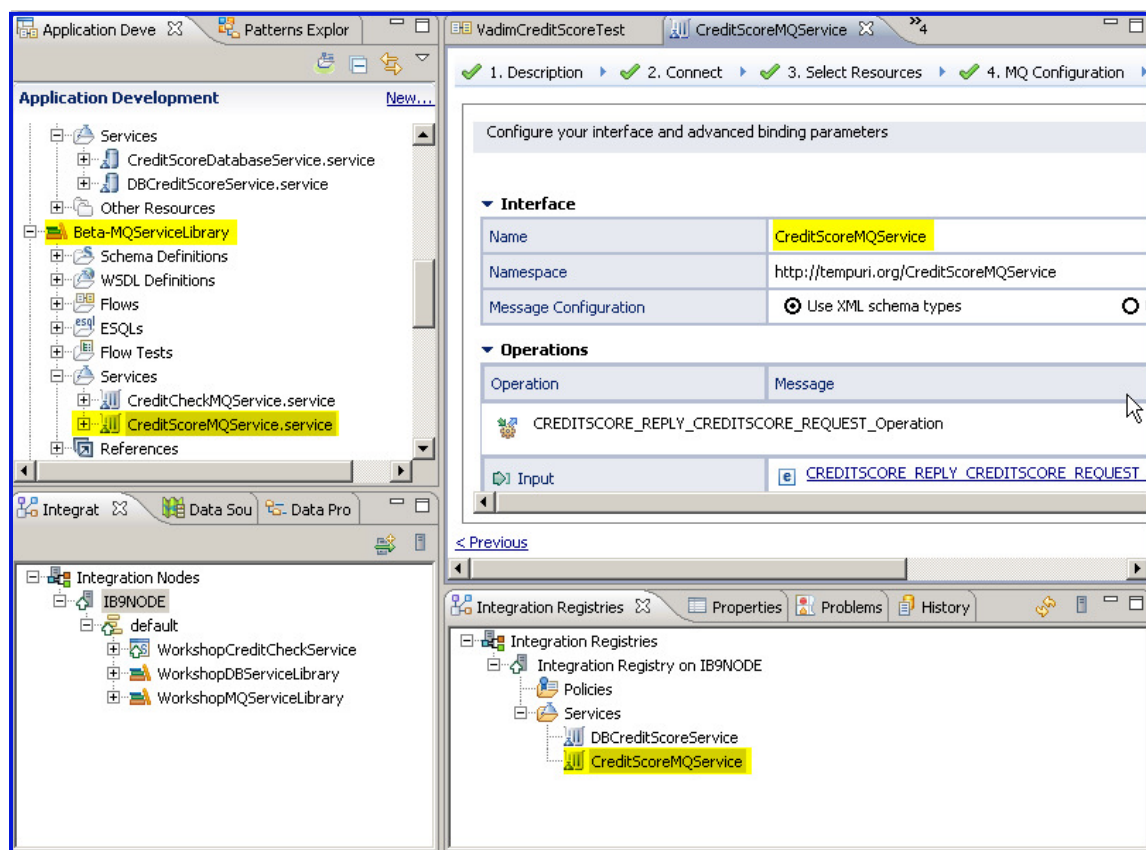
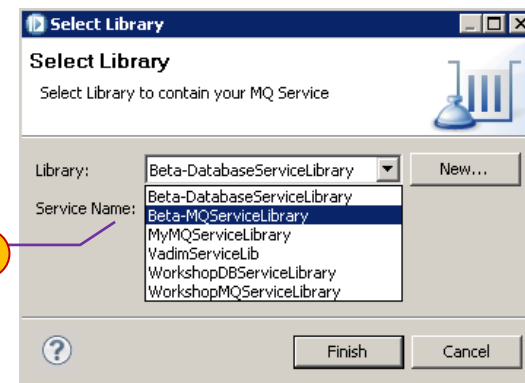
Published service appears in the "Integration Registries" view associated with the corresponding integration node (IB9NODE)

# Import service from integration registry



1 "Import" service from integration registry into workspace

Select the library for importing service definition.



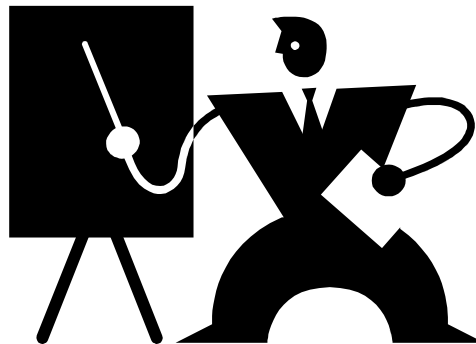
3 Retrieved service definition appears under *Services* folder in the navigator

## It's time for Labs 4 and 5!

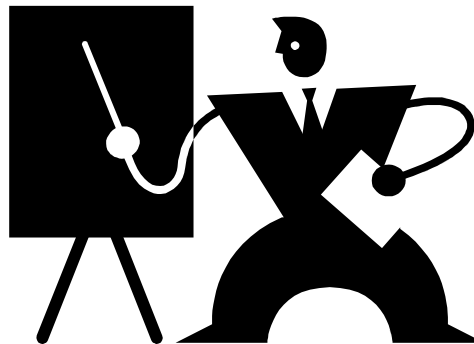
- Decision Services
- Service Discovery



The rest of the story...



## The rest of the story... Migration



## Migration from WebSphere Message Broker V6.1, V7 and V8

### ▪ Migration from WMB V6.1, V7 and V8

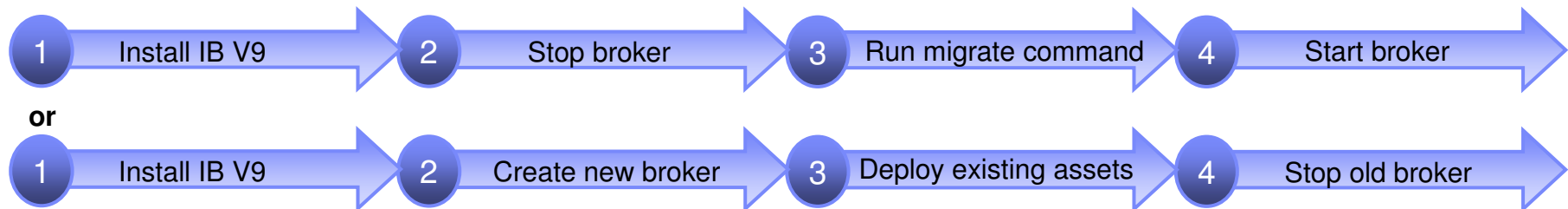
- All development assets (for example, message flows, ESQL, DFDL, Java, Maps and XSLT) import directly
  - Right-click convert action for pre-V8 maps; some manual tasks may be required
- Migrate brokers using a single command, or create new brokers for phased migration
  - No broker redeployment necessary when using built-in migrate command
  - All existing BAR files can be deployed to IB V9 brokers without change

### ▪ Migration commands for in-place migration

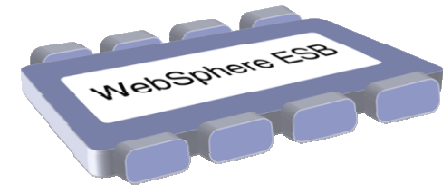
- Includes migration of configuration data including broker databases, queues and registry
- Forwards and backwards migration of existing components, in situ
  - `mqsिमigratecomponents` command (includes `-t` option for rollback to V7 and V8)

### ▪ Flexible co-existence options remove the need for additional hardware when migrating

- IB V9 co-exists on the same OS with all previous MB versions
- MQ V7.5 required for all IB V9 brokers
  - MQ V7.5 supported with all V6.1, V7 and V8 brokers for the purposes of V9 migration

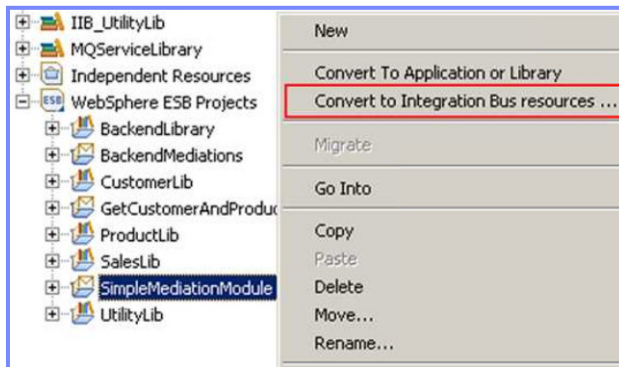


## Conversion from WebSphere Enterprise Service Bus



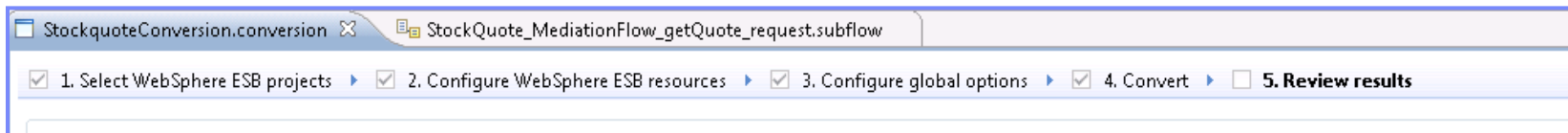
### ▪ Built-in conversion tools for WESB source assets

- Initial emphasis on web services use cases (for example, StockQuote)
- Advanced use cases over time; convert when appropriate for your installation
- Open framework for user and partner extensions



### ▪ Simple workflow creates IB resources

1. Export WESB PI from IID
2. Import mediations into Eclipse Toolkit
3. Right-click “convert” task to start conversion
4. Follow guided editor to generate resources
5. Task List will identify remaining manual steps
6. Iterate as necessary



### ▪ Open Conversion Framework

- Extensibility means more WESB primitives and resource types can be converted over time
  - No minimum version requirement of WESB source
  - Builds directly into WESB conversion editor
- Design allows for future assisted resource creation from non-Integration Bus sources, for example
  - eGate Java collaborations and Event Type Definition, exploiting existing JAXB support
  - ICS collaborations, including ASBO and GBO model, exploiting new GDM pattern enablement

## Simple Example Walkthrough – 1. Select WebSphere ESB projects

The screenshot shows the 'Convert to Integration Bus resources ...' option selected in the context menu of the WebSphere ESB Projects folder. A yellow callout box explains the conversion process. Below the callout, three red double-headed arrows labeled 3, 4, and 5 indicate the steps: 3. Select WebSphere ESB projects, 4. Convert WebSphere ESB resources, and 5. Review results. The main window shows a table mapping source projects to target Integration Bus projects.

**Conversion session file (.conversion)**

Conversion process  
tasks completed after automated conversion.  
combinations - results merged or overwritten.

3 4 5

Configure global conversion options ▶ 4. Convert WebSphere ESB resources ▶ 5. Review results

Select websphere ESB projects and their dependencies. Click the target Integration Bus Project name to change the default name.

[Import WebSphere ESB source projects for conversion into your workspace](#)

WebSphere ESB Source Project	Target Integration Bus Project
<input checked="" type="checkbox"/> TemperatureTranslate	IIB_TemperatureTranslate

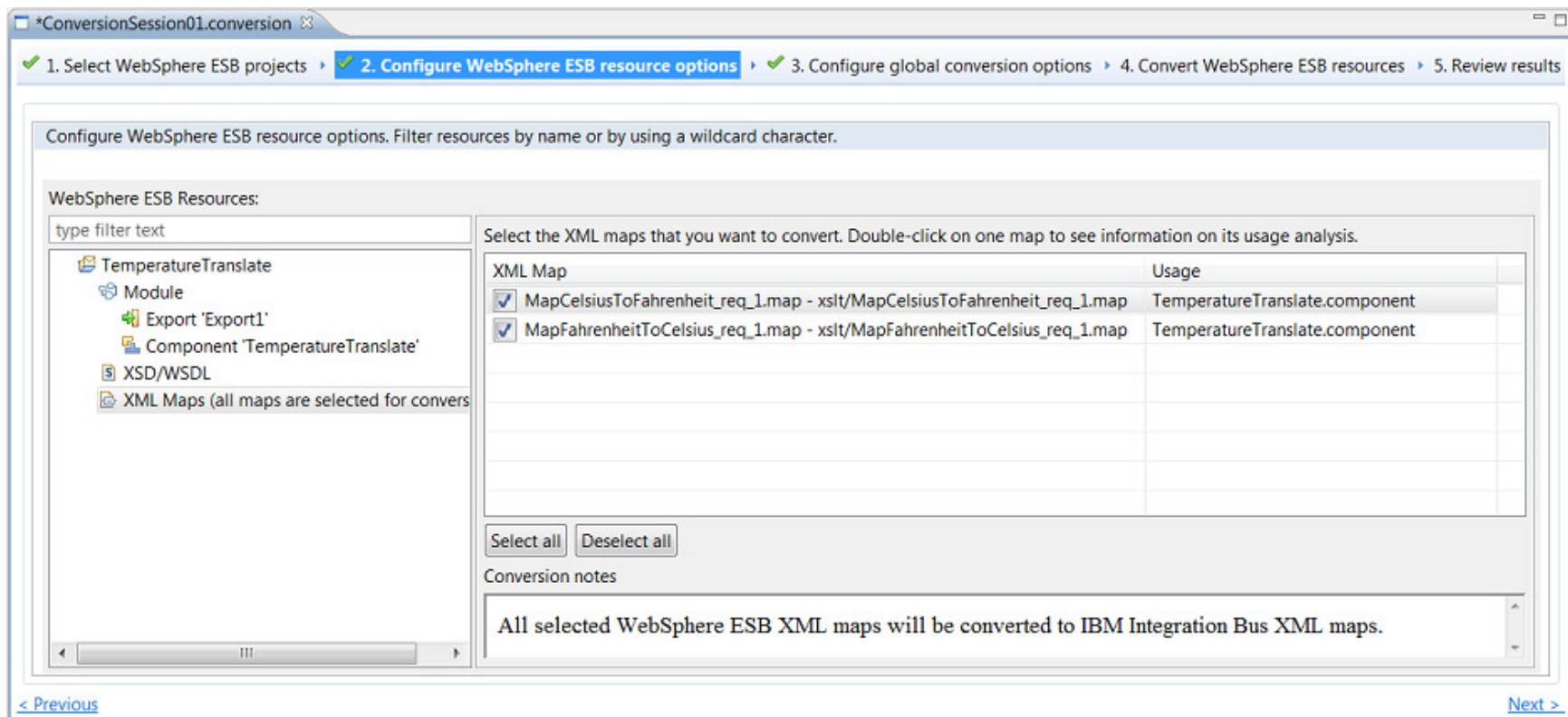
Select all Deselect all

☒ Include referenced WebSphere ESB projects

< Previous Next >

- Select one or more WebSphere ESB projects for conversion
- Target Integration Bus project name is configurable (recommend to use the default suggestion of prefixing with “IIB\_”)
- Referenced WebSphere ESB projects converted at the same time by default
- More granular view and options on individual resource conversion provided by next page of the conversion editor

## Simple example walkthrough – 2. Configure WebSphere ESB resource options



## Simple example walkthrough – 3. Configure global conversion options

\*ConversionSession01.conversion

1. Select WebSphere ESB projects 2. Configure WebSphere ESB resource options 3. Configure global conversion options 4. Convert WebSphere ESB resources 5. Review results

Specify how the conversion result should be recorded.

☐ Merge new conversion results with the results from previous runs of this conversion session

**Mediation Primitive Converters**

Each mediation primitive will be converted to a message flow node or subflow. You can supply your own converter to convert mediation primitives. Double-click on one mediation primitive to see information on its usage analysis.

Mediation Primitive	Convert to	Usage	Converter class
ErrorInput	Subflow placeholder	TemperatureTranslate.component	Placeholder converter
Input	Input	TemperatureTranslate.component	Built-in converter
InputResponse	Reply (for example SOAPReply)	TemperatureTranslate.component	Built-in converter
XSLTransformation	Map	TemperatureTranslate.component	Built-in converter

**Export and Import Binding Converters**

Each export or import binding will be converted to a message flow node or subflow. You can supply your own converter to convert an export or import binding. Double-click on one export or import binding to see information on its usage analysis.

Binding	Convert to	Usage	Converter class
Jax/Ws Export	SOAPInput	Export1.export	com.ibm.etools.mft.conversion.esb.extension.binding.JaxWsExportConverter

[< Previous](#) [Next >](#)

## Simple example walkthrough – 4. Convert WebSphere ESB resources

\*ConversionSession01.conversion

1. Select WebSphere ESB projects 2. Configure WebSphere ESB resource options 3. Configure global conversion options 4. Convert WebSphere ESB resources 5. Review results

Review the configuration details for this conversion session. Start the conversion of your WebSphere ESB resources. Double-click on a map entry to verify the list of maps that are selected for conversion.

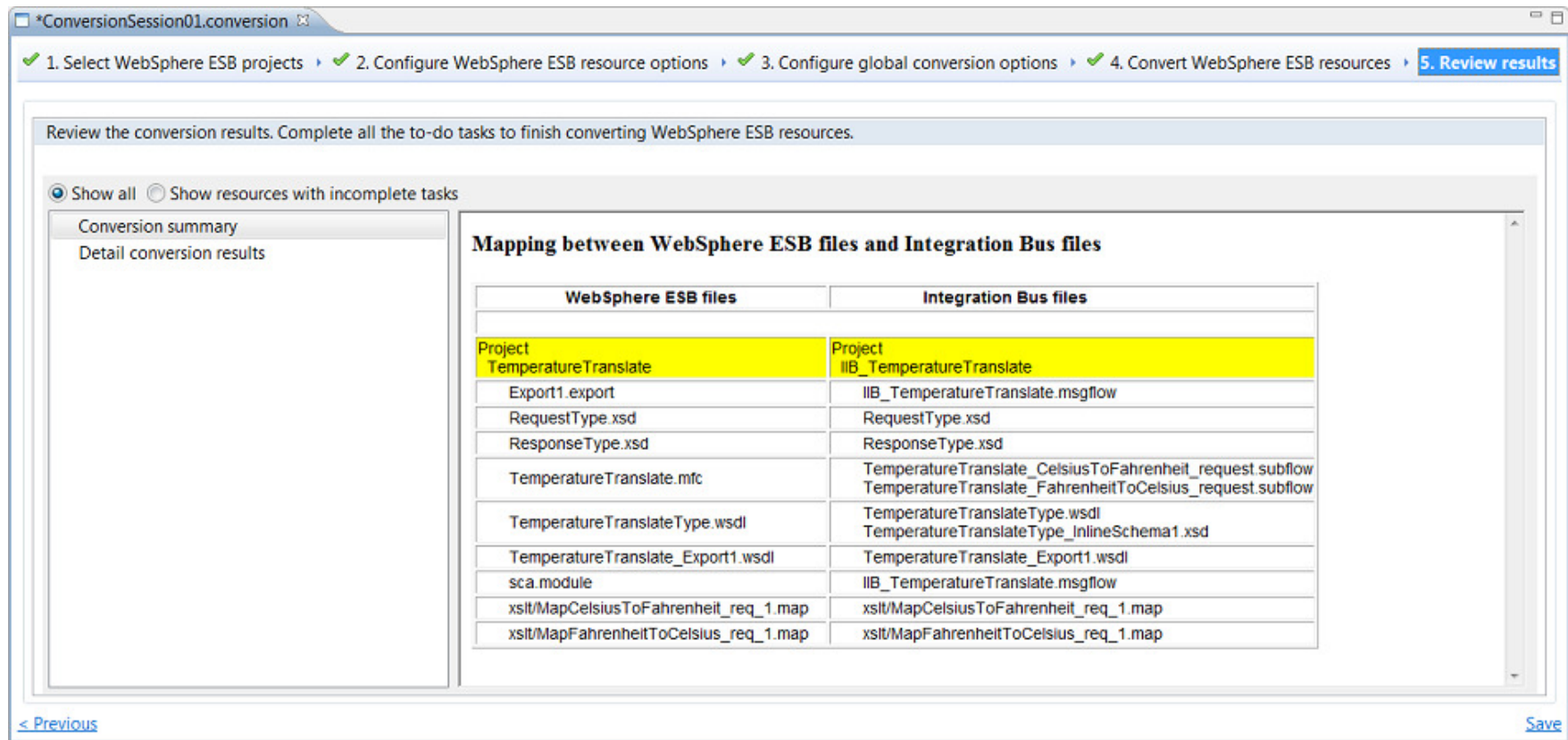
Summary of the conversion configuration:

WebSphere ESB resource	Type	Option	Value
TemperatureTranslate	Project	XML Maps to convert	xslt/MapFahrenheitToCelsius_req_1.map,xslt/MapCelsiusToFahrenheit_req_1.map
	Global option file:///...	Merge conversion result	false

Start conversion...

[< Previous](#) [Next >](#)

## Simple example walkthrough – 5. Review results



Review the conversion results. Complete all the to-do tasks to finish converting WebSphere ESB resources.

☒ Show all ☐ Show resources with incomplete tasks

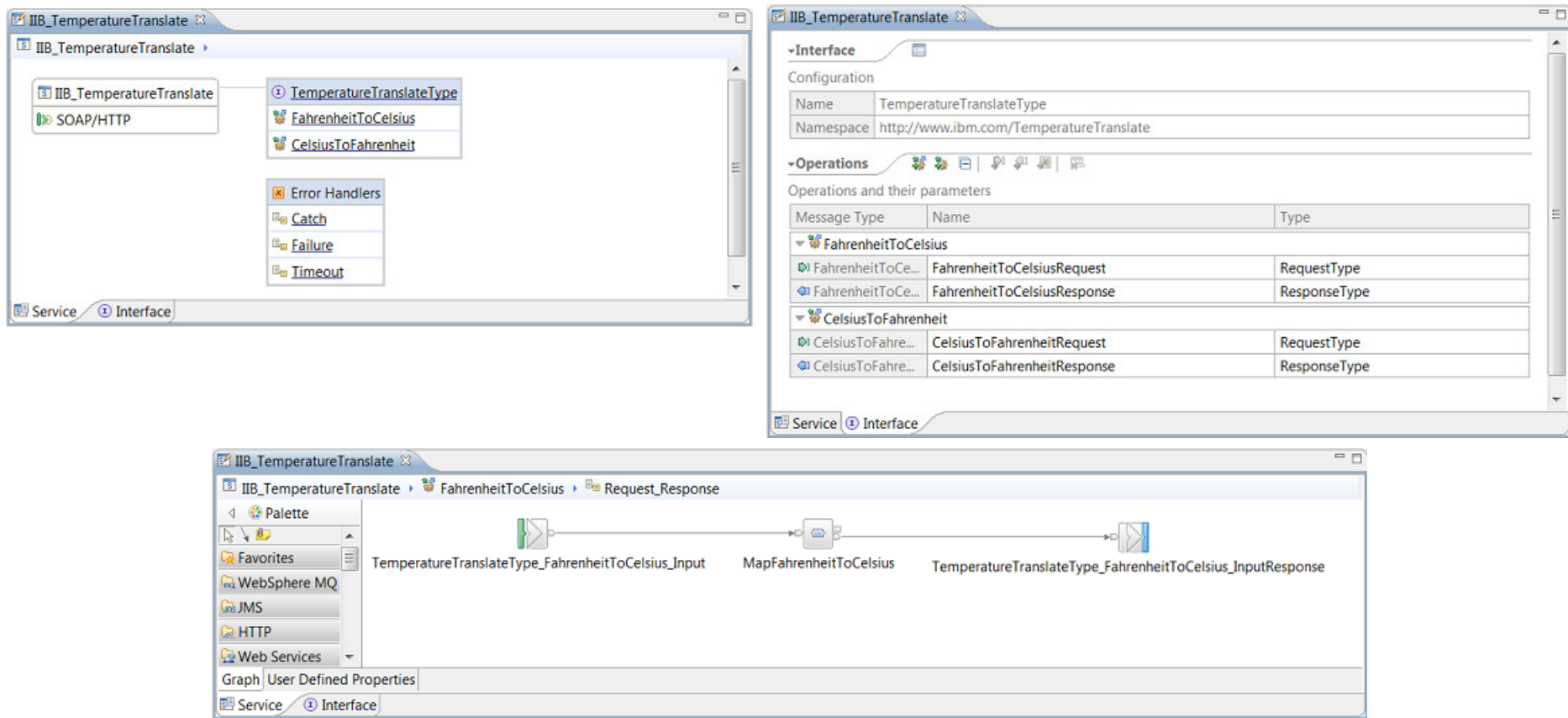
Conversion summary  
Detail conversion results

### Mapping between WebSphere ESB files and Integration Bus files

WebSphere ESB files	Integration Bus files
Project TemperatureTranslate	Project IIB_TemperatureTranslate
Export1.export	IIB_TemperatureTranslate.msgflow
RequestType.xsd	RequestType.xsd
ResponseType.xsd	ResponseType.xsd
TemperatureTranslate.mfc	TemperatureTranslate_CelsiusToFahrenheit_request.subflow TemperatureTranslate_FahrenheitToCelsius_request.subflow
TemperatureTranslateType.wsdl	TemperatureTranslateType.wsdl TemperatureTranslateType_InlineSchema1.xsd
TemperatureTranslate_Export1.wsdl	TemperatureTranslate_Export1.wsdl
sca.module	IIB_TemperatureTranslate.msgflow
xsit/MapCelsiusToFahrenheit_req_1.map	xsit/MapCelsiusToFahrenheit_req_1.map
xsit/MapFahrenheitToCelsius_req_1.map	xsit/MapFahrenheitToCelsius_req_1.map

[< Previous](#) [Save](#)

## Conceptual compare - IBM Integration Designer and IBM Integration Toolkit



- **IIB Integration Services have been specifically designed for their display in Toolkit to be familiar to WESB developers who are used to interacting with IBM Integration Designer**
  - In IBM Integration Designer you can navigate to the mediation flow representing a particular operation by clicking its hyperlink.
  - In IBM Integration Toolkit, you can navigate to the subflow representing a particular operation by clicking its hyperlink.

## It's time for Lab 6!

### ■ WESB Conversion



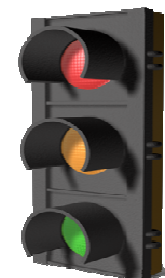
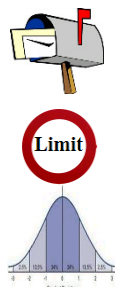
# Workload Management



## Making it easier to control the processing speed in Integration Bus

### • Message Flow processing rate control

- Provide intelligent mechanisms to increase and decrease processing speed
- Policy specifies goals for the processing rate of a message flow
  - DECREASE: Notify, Delay, Redirect
  - INCREASE: Add (increase threads), All (pre-emptively start all threads)
  - CONTROL: Restarting or reporting unresponsive flows or threads
- Learning mode that calculates the best values for policy
- Can be set at design time or changed operationally (CMP, command line and Web admin)



### • Allow more diverse Workload Management

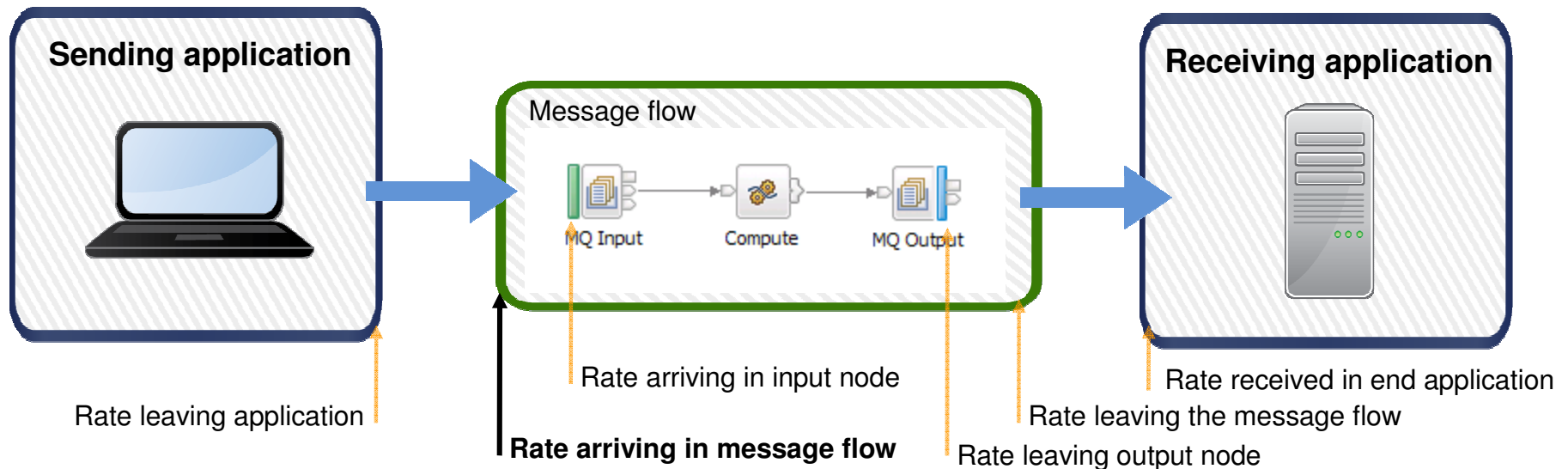
- Apply policy to different Broker artifacts:
  - Applications, services, individual nodes.
- Scheduling like between 12:00 a.m. and 6:00 a.m.
- Long term SLA like number of messages per day
- Quality of service like batch versus low latency



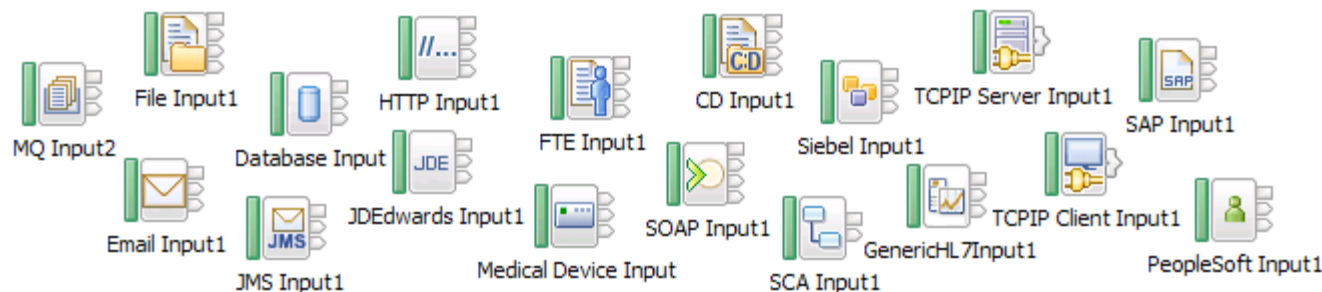
### • Allow Workload Management to be defined in a policy separate from the message flow

- Policy can be defined in the bar file on the Message Flow
- Or in broker's new built in Repository
- Use common repository component to allow policies to be stored in broker or elsewhere
- Policy can be changed and used in broker independently of where it is stored

## Message Flow processing rate control - Key rate terms



- There are various points in the flow of data from one application to another that the message rate can be measured and controlled
- The Rate arriving in message flow is used as the controlling rate for the message flow:
  - Effectively limits Rate received in end application
  - Includes the total rates of all input nodes of any type in the message flow



# Controlling integrations with policy

## Integration Workload Management

- Provide intelligent mechanisms to control processing speed
- Most common scenario is to reduce back-end server load
- Design allows more policy-based processing over time
- Can be applied to new or existing integration data flows

## Policy defines threshold limits and relevant actions

- Set thresholds for integration data flow throughput
- Specify actions at threshold, for example:
  - NOTIFY: Higher (or lower) than threshold generates publication
  - DELAY: Excessive workload will have latency added to shape throughput
  - REDIRECT: Send excess to input node's failure terminal or backout

## Web Console used to manage WLM policy

- Sophisticated behaviour controllable by broker WLM policy
- Workload can be managed across classes of message flows (for example, batch versus online)
- Policies stored in local registry, and dynamically configurable
- Developer can also specify limits as integration data flow properties

**Policies**

Overview

**WorkloadManagement**

Values that you do not define on this page are inherited from the message flow, if they are.

Policy Name: BatchWorkloads

Targets and Limits

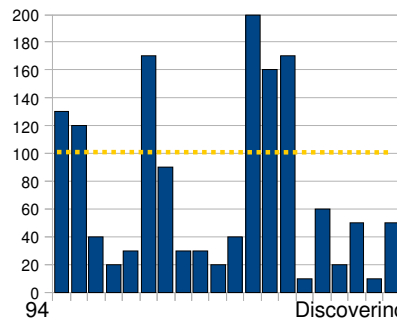
Notification Threshold: 100 messages

Maximum Rate: 300 messages

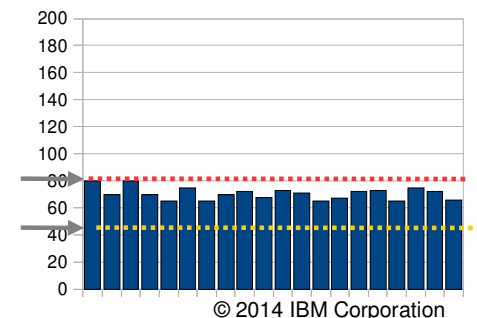
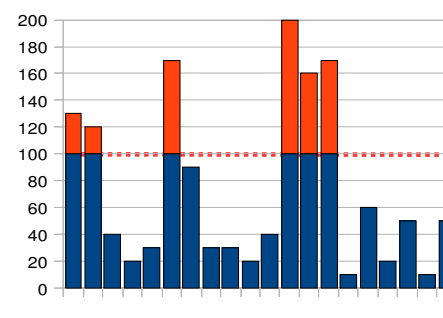
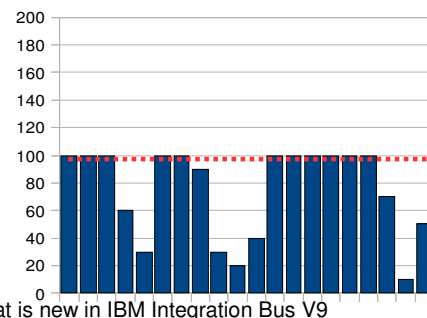
Additional Instances

Additional Instances: 1

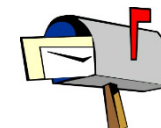
Start additional instances when flow starts: Yes



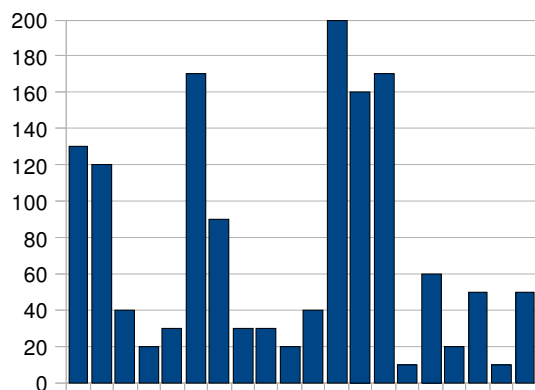
Discovering what is new in IBM Integration Bus V9



## Message Flow processing rate control - Notification

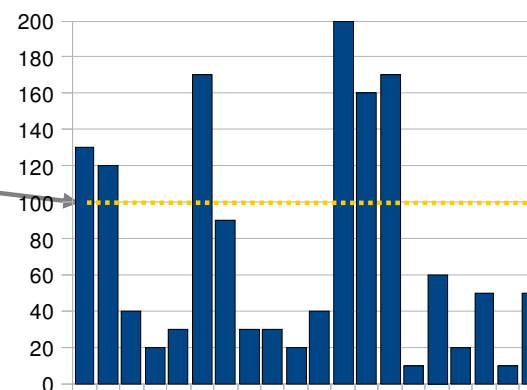


Rate leaving sending application

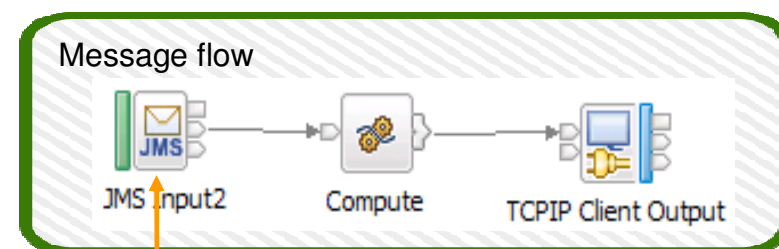


Processing rate in the message flow

Notification threshold set on the message flow.



- A sending application generates a higher (or lower) than expected message rate
- Configure broker to:
  - Send a notification when a threshold is exceeded or dropped below
  - MQ Pub/Sub mechanism used to decouple notification from consumers
    - Also write to Activity trace
    - And write to User trace
- Action to reduce message rate up to the user:
  - Ramp back sending application
  - Email administrator to investigate
  - Stop message flow to protect receiving application

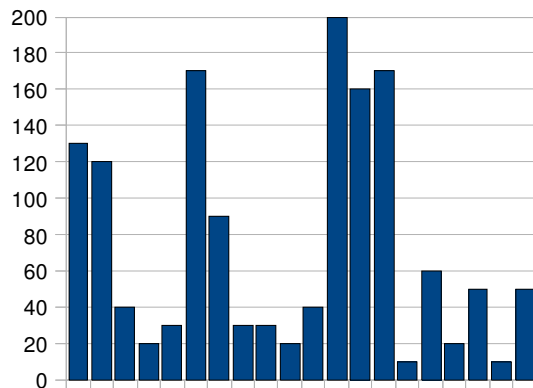


Count messages processed every 20 seconds

## Message Flow processing rate control – Delay

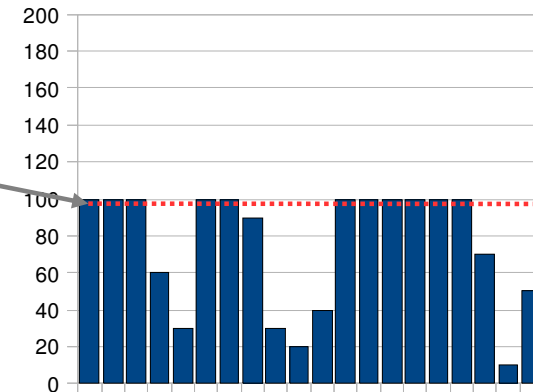


Rate leaving sending application

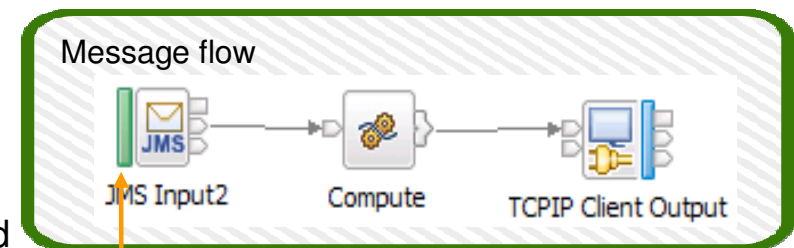


Processing rate in the message flow

Maximum rate set on the message flow



- A sending application generates a “bursty” message rate
- A receiving application consuming the messages can handle the average rate but not short term fluctuations
- Configure message flow to:
  - Limit the rate - Calculated on a message by message basis
  - Delay messages if going too fast
- Time is measured before getting message
- Time is measured again before getting next message
- Delay is made if time difference is less than the time required to keep to the maximum rate

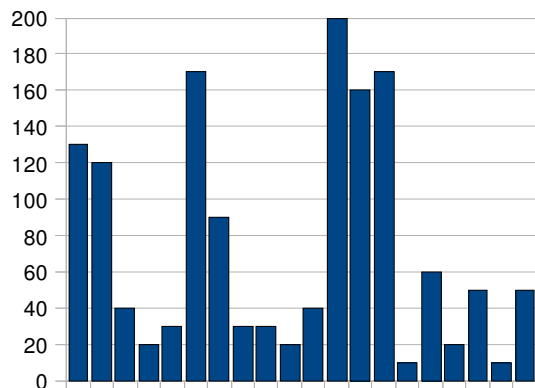


Delay point before any data is got or received  
© 2014 IBM Corporation

## Message Flow processing rate control – Redirect



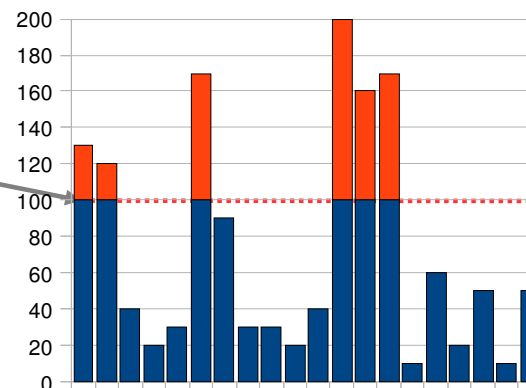
Rate leaving sending application



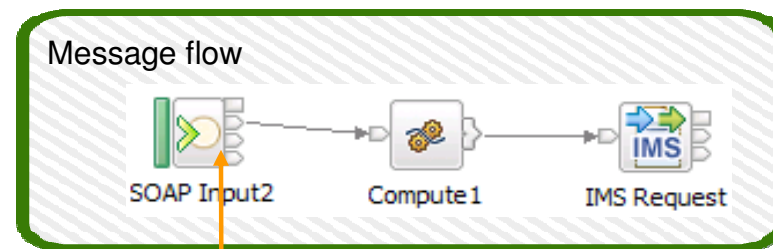
Processing rate in the message flow

Maximum rate set on the message flow

Limit action set to Redirect on the message flow

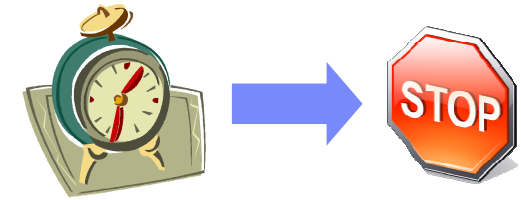


- **Messages can NOT be delayed because either:**
  - Messages from the sending application can not be queued
  - Receiving application can not cope with the long term message rate
- **Configure message flow to:**
  - Limit the rate - calculated on a message by message basis
  - Redirect messages if going too fast (send to the failure terminal)
- Time is measured before propagating message
- Time is measured again before propagating next message
- Redirect to failure is made if time difference is less than the time required to keep to the maximum rate



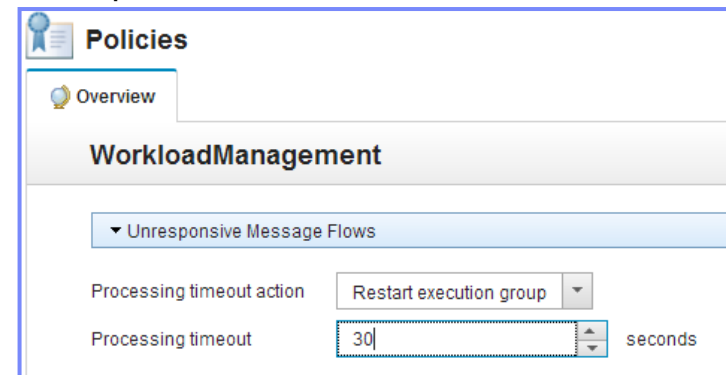
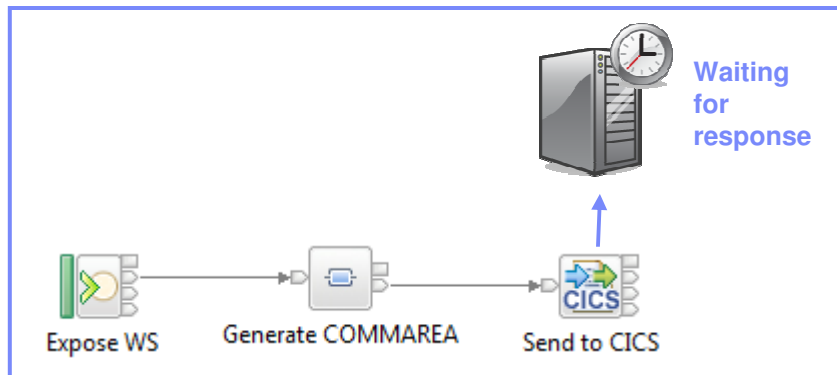
Redirect point before any data is propagated

© 2014 IBM Corporation



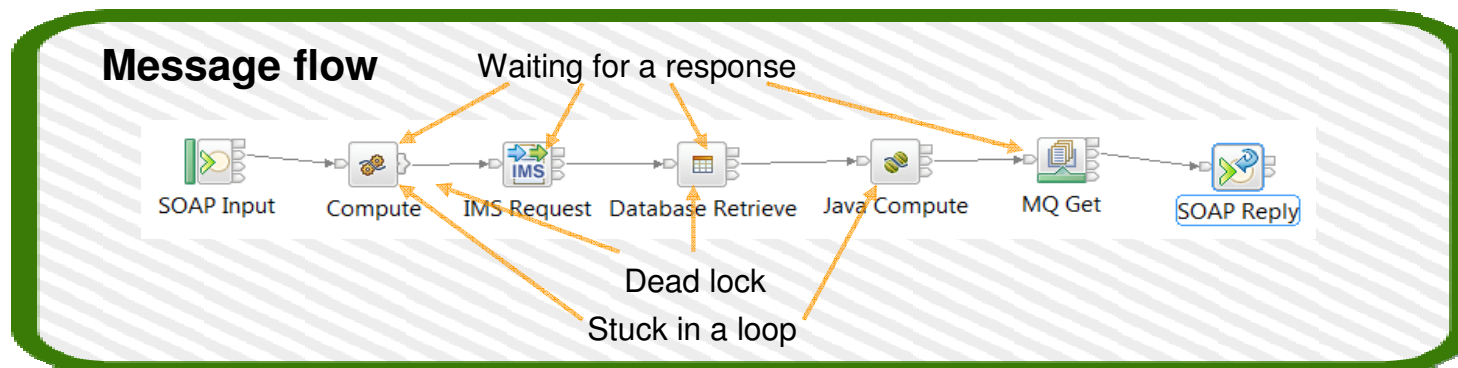
## Managing unresponsive integration flows



- **Target unresponsive flows through policy to improve overall system reliability**
  - Additional WLM option aimed at unresponsive integration flows
  - An integration flow can become unresponsive for multiple reasons
    - For example, waiting for external system, infinite loop, deadlock, malformed XML



- **Flexible configuration, actions and reporting options**
  - Specify threshold at which flows are considered unresponsive (for example, 30 seconds for processing)
    - Configured via WLM policy, or directly on the flow in the BAR file
  - Define action to trigger when flow considered unresponsive
    - Administrative notification through a new “timeout exceeded” event message
      - If flow eventually continues through to completion, a second event is published
    - Restart the integration server (execution group) on which the unresponsive flow is running
  - new command option to forcibly stop integrations manually: `mqsistopmsgflow -f`

## Message Flow processing rate control – Unresponsive flows



- Message flow processing can become unresponsive when:
  - Waiting for a response from an external system
  - Processing an infinite loop or a calculation that takes a very long time
  - Deadlocked between two resources
- How to get out of this situation?
  - Kill the execution group process  Only mechanism in the past
  - new** – Run a command to force the stopping of a message flow  or REST, Web, CMP, Toolkit.
  - new** – Define a policy which specifies the maximum time allowed for processing a message
    - Publish a report on what the Instance (thread) is doing and has just done
    - Optionally restart: Execution group, Message flow or Instance (thread)

## Message Flow processing rate control – Stopping an Instance

Choose a stopping mechanism:



Programming  
Domain

**Mark**

### Conversations

Please stop  
when you are  
ready

**Interrupt**

Please stop as  
soon as possible

### Transactions & Exceptions

No exceptions caused and  
transaction is completed.  
Standard message flow  
stopping mechanism since  
v2.0

One exception thrown and  
transaction rolled back if  
exception is not handled.  
Uses only safe thread  
mechanisms.



Operations  
Domain

**Force**

**BANG!**

Something is not  
right.

**Restart  
Process**


Repeated exceptions and  
signals caused.  
Transactions will be  
rollback. Possibility the  
process will be restarted.

Process restarted and all  
outstanding transactions are  
terminated

## Message Flow processing rate control – Stopping flow using a command

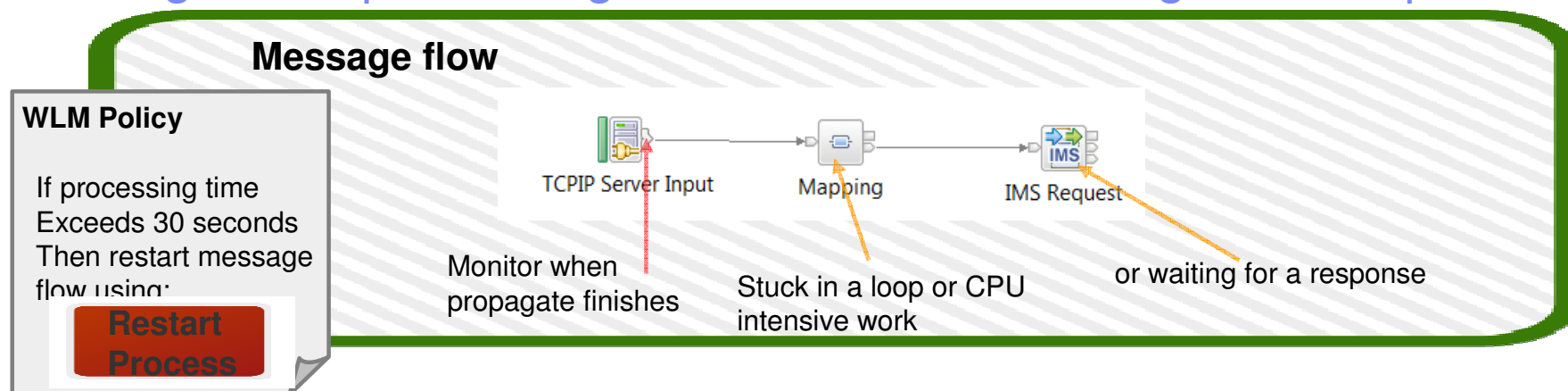
- **mqsistopmsgflow** in previous versions uses the **Mark** mechanism to stop flows
- Add a new option to allow: **Interrupt**, **Force** or **Restart Process** instead
- It is possible to combine commands to escalate stopping the flow. For example:

```
c:\>mqsistopmsgflow MB8BROKER -e default -m test -w 30
c:\>mqsistopmsgflow MB8BROKER -e default -m test -w 30 -i interrupt
c:\>mqsistopmsgflow MB8BROKER -e default -m test -w 30 -i force
c:\>mqsistopmsgflow MB8BROKER -e default -m test -w 30 -i restartProcess
```



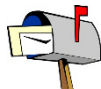
- Also exposed through the following APIs:
  - CMP
  - REST
  - Web Administration Interface
  - IBM Integration Toolkit

## Message Flow processing rate control – Detecting an unresponsive flow



- WLM policy attached to a flow to specify a maximum processing time for any instance (thread) after it has left an input node
- Monitored using a separate thread that publishes a notification when a timeout occurs
- Additional corrective action can be configured:
  - No action, leave it to user to perform an action based on notification
  - Restart message flow: **Mark** or **Interrupt** or **Force** or **Restart Process**
  - Stop message flow: **Mark** or **Interrupt** or **Force** or **Restart Process**
  - Restart message flow instance (thread): **Mark** or **Interrupt** or **Force**

## Message Flow processing rate control - Workload properties that can be set



- Notification threshold (Messages per second)
  - The rate at which notification will be published when either exceeded or dropped below
  - Default: Infinite
- Maximum rate (Messages per second)
  - The maximum rate a flow will process messages
  - Default: Infinite
- Limit action
  - Delay or Redirect
  - Default: Delay



The screenshot shows the IBM Integration Bus V9 Workload Management configuration interface. On the left, the 'Manage' pane displays a tree view of resources under 'udp.msgflow', including 'udp' (Application) and 'udp.msgflow' (Message flow). The 'udp.msgflow' resource is selected, and its details are shown in the 'Details' pane. The 'Workload Management' section is active, showing the following properties:

Property	Value
Policy	test2
Notification Threshold (Messages per second)	90
Maximum Rate (Messages per second)	100
Additional Instances	0
Start additional instances when flow starts	<input type="checkbox"/>
Start Mode	Maintained
Commit Count	1
Commit Interval	0

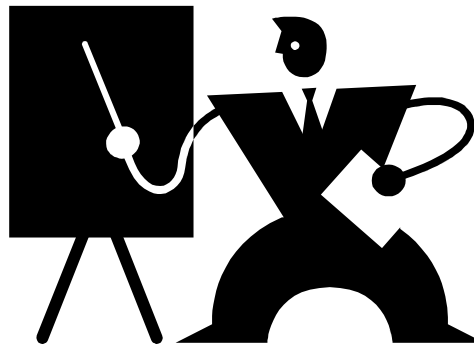
It's time for Labs 7 and 8!

- Workload Management



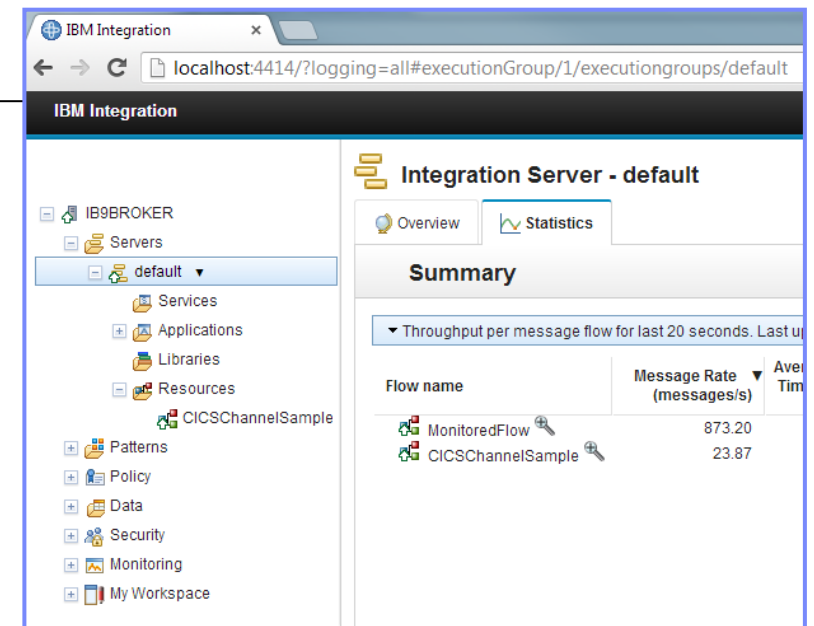
## The rest of the story...

### Web admin/analytics

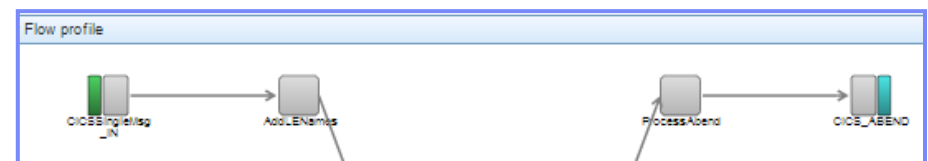


## Web visualization and analytics

- **A comprehensive tool for web management**
  - Manage all integration resources from zero-footprint client
  - Analyze integration performance in real-time
  - Supported on a variety of browsers: IE10, Firefox, Safari...
  - Complements MQ Explorer and WAS Admin consoles
- **Managing Integration Resources**
  - View top-level integration node properties
  - Add/remove/change integration servers
  - Start/Stop integration data flows
  - Role based access to control usage
  - Advanced options include data replay, policy & monitoring
  - Exploits underlying public REST/JSON API
- **Integration Performance Analysis**
  - Operational experience; no developer intervention required
    - new and existing flows can exploit without change
  - Many metrics of integration flow available in real-time
    - CPU & I/O time shown by default in integration analyzer
    - Other metrics include thread, data sizes, errors...
  - Flexible display includes data tables and flow profile
    - Drill down to understand detailed behaviour
  - Exploits underlying MQTT web sockets technology
    - Asynchronous notification at low CPU cost



Node	Average Elapsed Time (ms)	Average CPU Time (ms)	Node type
CICS Request	21.6	14.7	CICSIPICRequestNode
CreateCollection	6.7	2.8	ComputeNode
ProcessChannel	2.0	0.3	ComputeNode
CICS_OUT	1.3	0.1	MQOutputNode
CICS_IN	0.7	0.1	MQInputNode
AddLENames	0.0	0.0	ComputeNode
CICSSingleMsg_IN	0.0	0.0	MQInputNode
CICS_ABEND	0.0	0.0	MQOutputNode
ProcessAbend	0.0	0.0	ComputeNode



## Flow comparison










### **A** Application - Coordinated Request Reply MQ Application

Overview

Statistics

#### Flow comparison

▼ Throughput per message flow for last 14 seconds. Last updated at 11:22:03 GMT Standard Time.

Flow name	Message Rate (messages/s)	Average Elapsed Time/Invocation (ms)	Average CPU Time/Invocation (ms) ▲	Total Input Messages	Active Threads	Backouts	Container
 BackendReplyApp 	27.06	1.1	0.1	366	1	0	 default/Coordinated Request I
 Request 	32.33	29.8	10.4	453	1	0	 default/Coordinated Request I
 Reply 	26.26	38.0	13.3	355	1	0	 default/Coordinated Request I

▼ Nodes for all flows in Coordinated Request Reply MQ Application

Node	Average CPU Time (ms) ▲	Average Elapsed Time (ms)	Total Elapsed Time (ms)	Total CPU Time (ms)	Invocations	Node type	Parent Flow
GetRequestMsg	0.1	0.1	123.4	2.3	1404	MQInputNode	default/Coordinated
StoreOriginalMQMD.FlowOrder	0.1	0.1	15.1	4.3	1404	FlowOrderNode	default/Coordinated
GetBackendReply	0.1	0.1	94.5	1.7	1404	MQInputNode	default/Coordinated
GetRequestMsg	0.2	0.1	172.3	1.8	1404	MQInputNode	default/Coordinated
StoreOriginalMQMD.PutToStore	0.2	0.1	170.5	2.8	1404	MQOutputNode	default/Coordinated
StoreOriginalMQMD.SaveOriginalMQMD	0.2	0.1	280.6	5.4	1404	ComputeNode	default/Coordinated

## Flow analysis – Line graphs

### Data Flow - BackendReplyApp

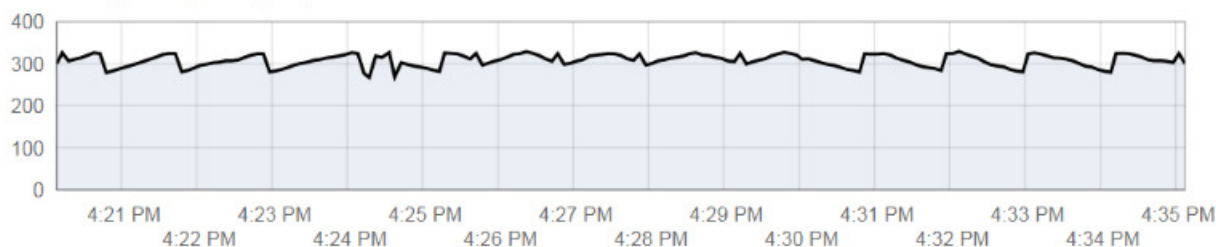
[Overview](#)[Statistics](#)[Policies](#)

#### Flow analysis

▼ Session started 11:27:23 GMT Standard Time (2 minutes ago). Last updated at 11:29:27 GMT Standard Time

Time range: Session ▼

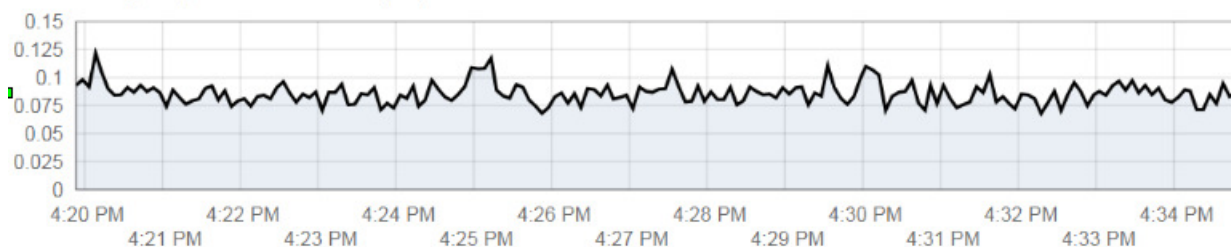
Message Rate (messages/s)



Message Rate (messages/s) ▼

Latest	299.82
Average	308.09
Highest	329.10
Lowest	267.28

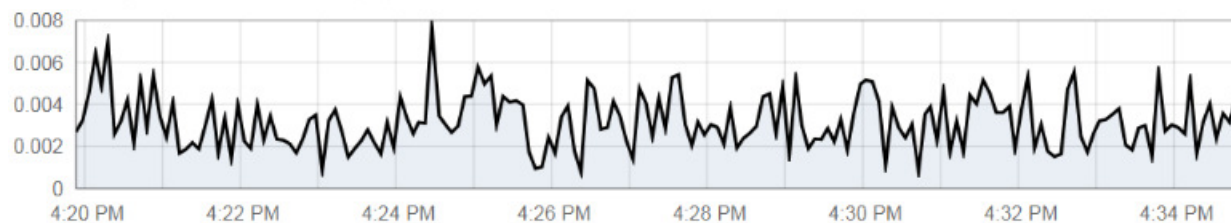
Average Elapsed Time/ Invocation (ms)



Average Elapsed Time/ Invoice ▼

Latest	0.1
Average	0.1
Highest	0.2
Lowest	0.1

Average CPU Time/ Invocation (ms)



Average CPU Time/ Invocator ▼

Latest	0.1
Average	0.1
Highest	0.1
Lowest	0.1

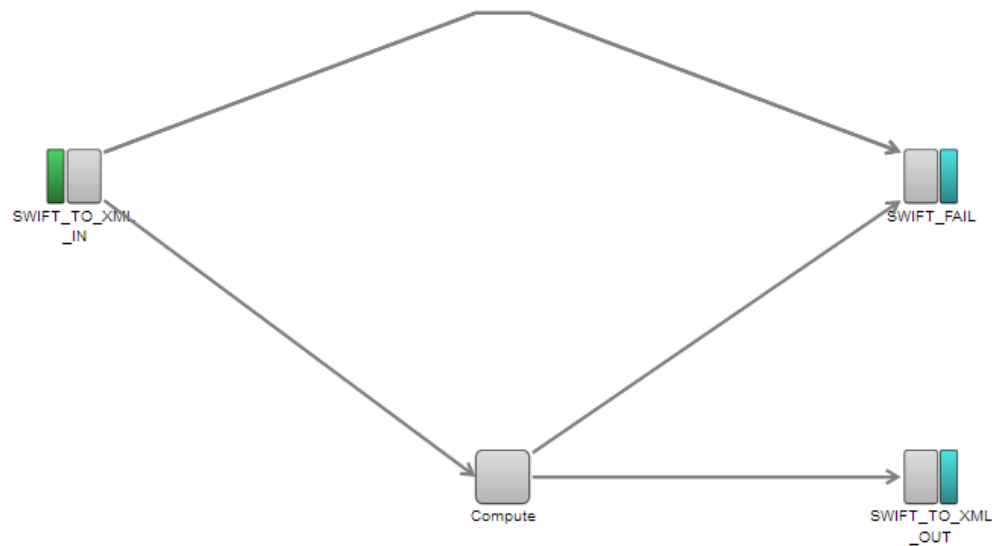
## Flow analysis – Nodes data and flow profile

▼ Latest data per node

Minimum | Average | **Maximum**

Node	Maximum CPU Time (ms) ▼	Maximum Elapsed Time (ms)	Node type
Compute	2.1	3.1	ComputeNode
SWIFT_TO_XML_OUT	0.7	2.5	MQOutputNode
SWIFT_TO_XML_IN	0.4	0.6	MQInputNode
SWIFT_FAIL	0.0	0.0	MQOutputNode

▼ Flow profile



## It's time for Lab 9!

- Web Admin

